THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW.

OLD SERIES Vol. 21. No. 12 — NEW YORK, DECEMBER, 1915. — NEW SERIES Vol. 13. No. 12

COLLAPSIBLE ALUMINUM CUP

AN ARTICLE DEALING WITH THE DRAWING UP OF THIN ALUMINUM.

BY J. P. SHEEHY.

The following article is a description of dies and tools used in the manufacture of an aluminum collapsible cup made from No. 24 gauge sheet aluminum, as shown in Fig. 1. The cup is made in 4 sections (as shown in Fig. 4) and the drawing and swedging operations are shown in Fig. 2. A shows the first operation, which blanks and draws the shell in one stroke of the press and B and C the redraws. In the shell B the stock is not reduced in thickness, while the shell, C, is reduced to .012 of an inch. The shell has a fine finish after this operation and is the

FIG. 1. THE ALUMINUM COLLAPSIBLE CUP.

same diameter at the top and bottom. The swedging operation forms the bottom and tapers the sides, this taper is designed so that when the cup is cut into sections and assembled together, each section laps or extends over the other 3/32 of an inch, which insures a water-tight joint and it is impossible to pull the sections apart.

The tools used for drawing shell A, Fig. 2, are shown in Fig. 8, which was used in a Ferracute double acting press, A, the blanking and drawing die is made of tool steel discs to fit standard die-shoes, the die being hardened and ground all over. B, the blanking punch and hold-down is made of machinery steel and is not hardened. This must be a very close fit, as this shell is made of dead soft aluminum.

The drawing punch, C, is made of tool steel hardened and ground all over. This punch must be the correct size for, if too small it will allow the stock to wrinkle and if too large the stock will harden and will not work well on the next operation. Fig. 9 shows the design of tools used on the next two operations, B and C. Fig. 2. These tools are made of tool steel hardened and ground all over. Care must be taken on the shell C as the stock has to be reduced from .022 to .012 of an inch and must have a smooth finish on the inside and outside, this being the most important operation, as the shell is left so as to stretch or enlarge the top of the shell and make the bottom smaller for the taper which is done on the

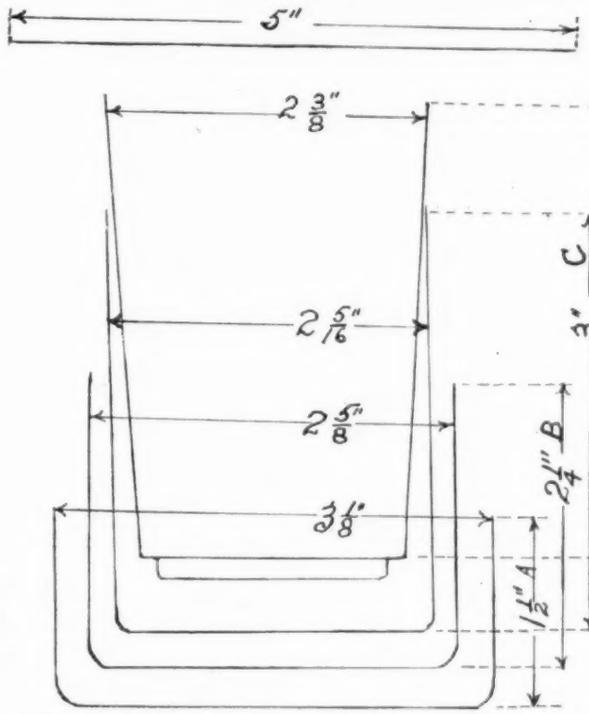


FIG. 2. SUCCESSIVE DRAWING OPERATIONS STARTING WITH A FLANK OF .022 SOFT ALUMINUM.

swedging operation, D, Fig. 2, which is accomplished on tools as shown in Fig. 10. The die is made of tool steel hardened and ground. The taper on this die is very important, if it is not correct the shells will not open enough and too much stock will be used on the laps of the sections and the shell will not be smooth and therefore will not have a good appearance. The punch is also made of tool steel, is hardened and ground and it must fit the die as the shape of the shell depends on the punch. It will also be seen in Fig. 2, at D, the bottom of the shell is offset to take the bottom ring of the cup. There is a

spring knockout in the bottom of this die which starts the shell and which can be removed from the die very easily.

The shells are now edged to the proper length and are

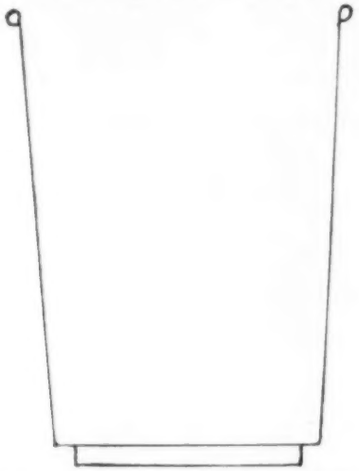


FIG. 3. THE SHELL EDGED AND ROLLED.

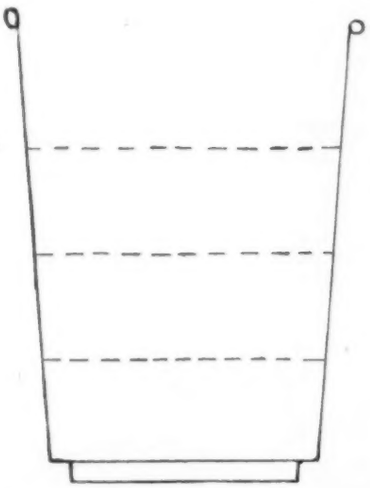


FIG. 4. SHOWING THE FOUR SECTIONS OF THE CUP; THE DOTTED LINES SHOW THE CUTTING LINES.

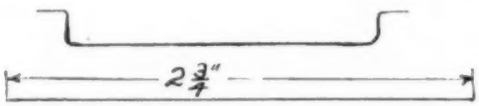


FIG. 5. THE FIRST OPERATION ON THE BOTTOM.

FIG. 6. THE ROLL ON THE BOTTOM.

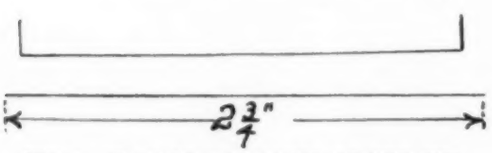


FIG. 7. PLAN OF THE COVER OF THE CUP.

rolled as shown in Fig. 3. This operation was done on a hand operating edging lathe. The tools used are as shown in Fig. 11. The chuck is made of machinery steel and to fit spindle of lathe is bored out, tapered to receive shell D. The rolling tool, which is set so as to roll the shell so that the cover will be a tight fit and if properly made the shells can be all rolled the same diameter, which is very important. The cover is to fit tight enough so as to open the cup when cover is removed.

The shells are now washed and dried and cut into four sections, as shown in Fig. 4. This is done with tools as shown in Fig. 12, the chuck being made with three tool steel rings hardened and ground and the balance of the chuck is made of machinery steel. The three tool steel rings are made a trifle larger in diameter

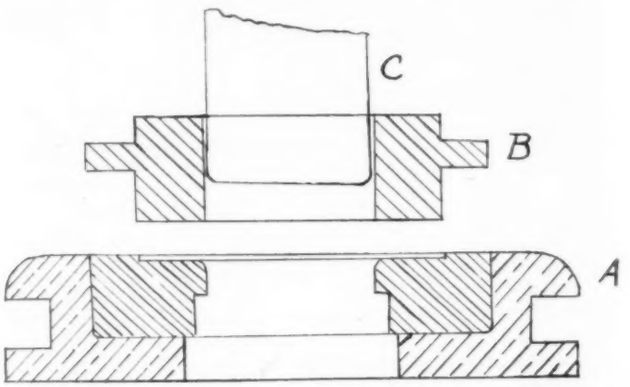


FIG. 8. TOOLS USED IN DRAWING THE SHELL AS IN FIG. 2.

than the body of the chuck. They can be ground from time to time as they wear, the three cutters, which are tool steel hardened and ground, are set so as to just cut through the metal and not come in contact with the hardened steel rings. It will not take but a few shells to cut, if the tools are not set properly the cutters will be destroyed.

The cover shown in Fig. 7 is made on tools of the same design as shown in Fig. 8, although only one opera-

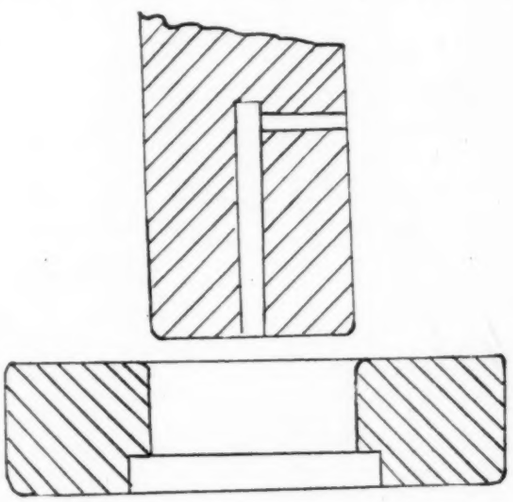


FIG. 9. TOOLS FOR OPERATIONS SHOWN IN FIG. 2 "B" & "C."

tion is required to make this cover. The tools being carefully designed so that there is no need for trimming the shells. Fig. 5 shows the first operation on the bottom, which is done on tools of the same design as shown in Fig. 8, except there is a spring knockout which pushes the shell out of the die. As will be seen the shell has a straight flange equal to the roll as shown in Fig. 6. The shells are not trimmed as the blank is of the correct diameter and are taken from the press and have the bead rolled on with tools as shown in Fig. 13, there is a hole to

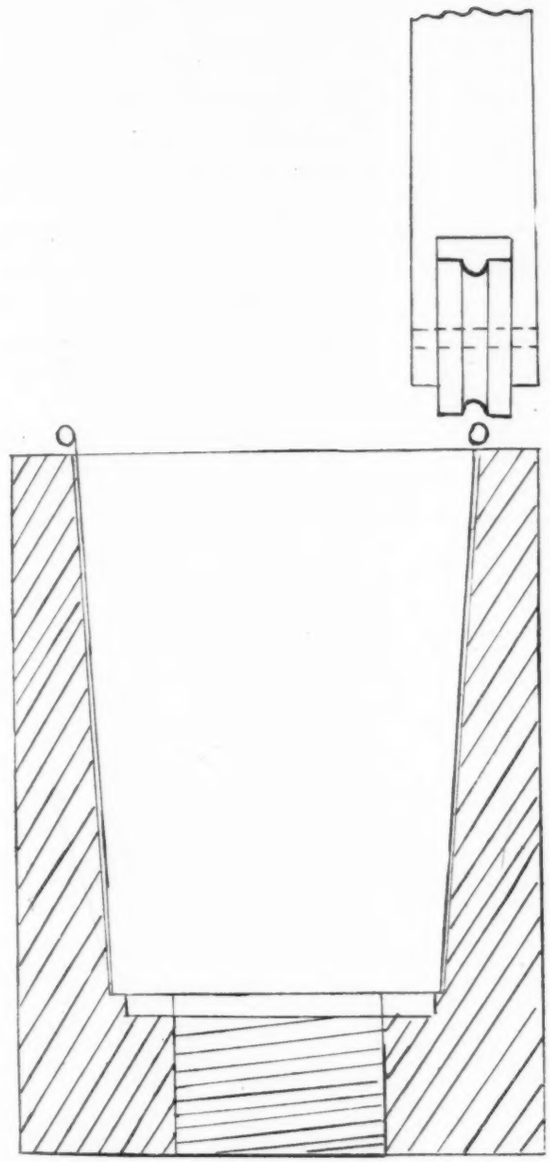


FIG. 10. TOOLS FOR SWEDGING OPERATION SHOWN AT "D" FIG. 2 AND ROLL TOP AS SHOWN IN FIG. 3.

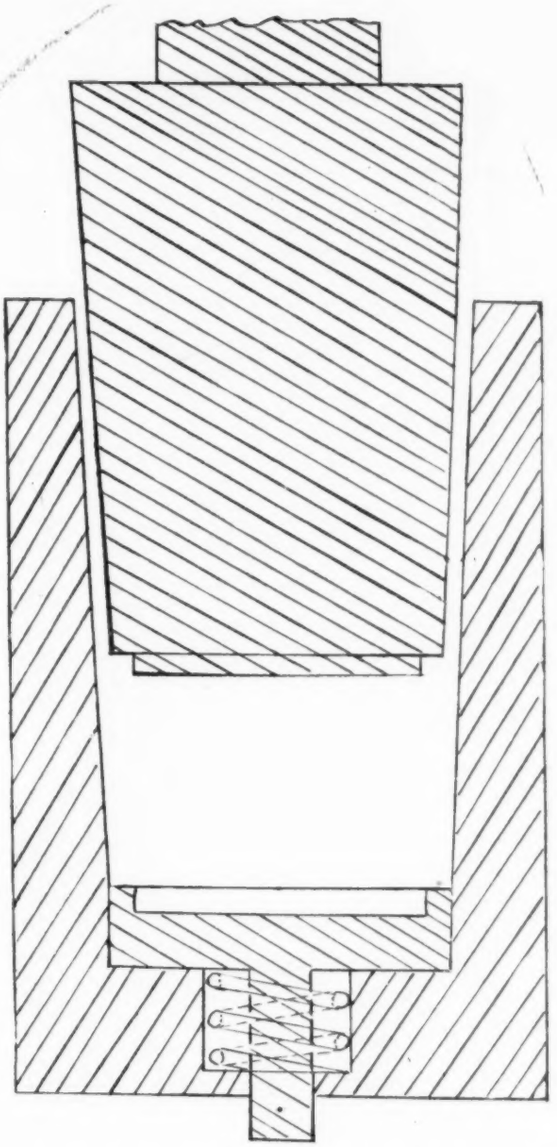


FIG. 12. TOOLS FOR CUTTING CUP IN 4 SECTIONS AS SHOWN IN FIG. 4.

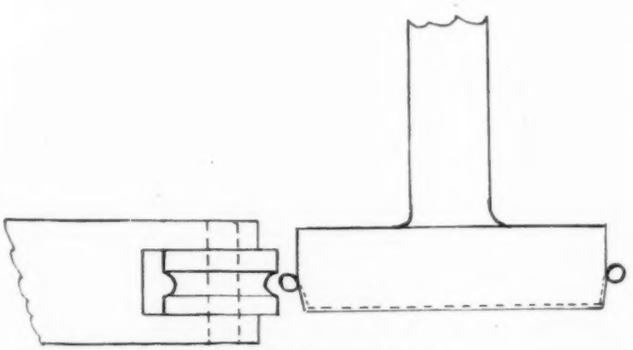


FIG. 11. TOOLS USED TO EDGE.

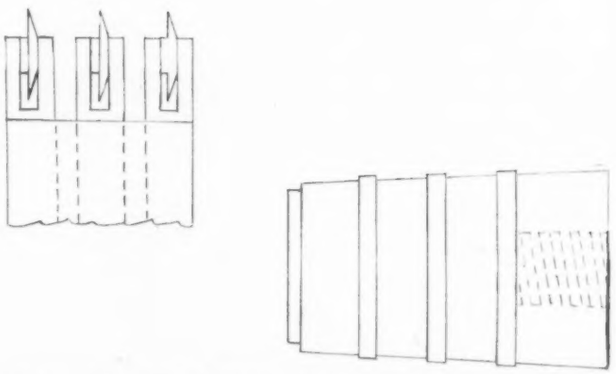


FIG. 13. TOOLS FOR ROLLING ON BEAD AS SHOWN IN FIG. 6.

be put in this shell to fasten the cup sections together and is accomplished in a set of double action tools as shown in Fig. 14 as the blank was of sufficient size to make a small size box. The cover and bottom for a box was made on the same tools, as blanking out the center of the shell utilizing the scrap, the cover and bottom of the box could then be finished into a bulge or straight side box

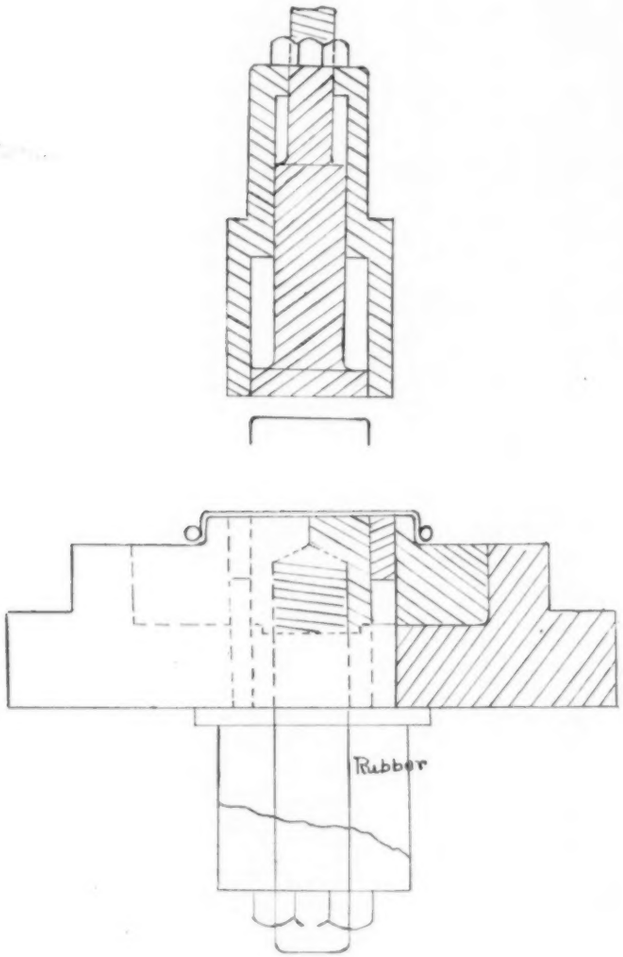


FIG. 14. DOUBLE ACTION TOOLS FOR PUTTING CUP SECTIONS TOGETHER.

as the trade might require. The shells are all washed and dipped in acid and are satin finished, and in most cases the covers of the cup are printed or embossed. The printing is done on a regular printing press with a half-tone. They are now assembled, the bottom being swedged on and inspected and are wrapped in tissue paper and packed in boxes which hold one dozen cups.

NEW ALUMINUM PLATING PROCESS.

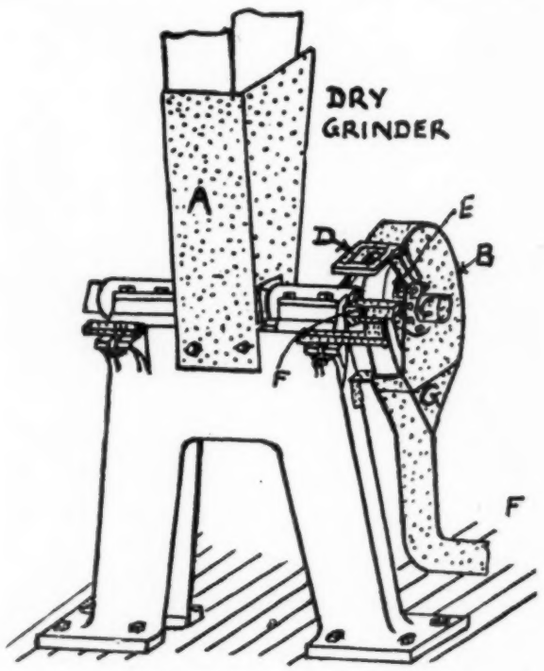
A French metallurgist is said to have solved the problem of giving aluminum a coating that will take a high polish and will safeguard it against the effects of the air and of certain foods. By successive baths of boiling lye, cyanide of potassium and hydrochloric acid containing ferrous chloride he produces a surface that takes a plating of nickel so perfectly that the metal can be rolled into plates, drawn into wires or hammered into any shape without in any way injuring the film of nickel.

SAFEGUARDING GRINDING MACHINES

By P. W. Blair.

Owing to the fact that the different states have the Workmen's Compensation Act, the manufacturers in the non-ferrous metal lines throughout the country have fallen in line and have adopted many safety devices. Grinding machines, which are so indispensable in the modern factory, are often the source of danger if not properly guarded.

A leading concern in Michigan which manufactures brass goods have adopted efficient guards for all of their dry and wet grinders as shown in the accompanying illustration. The one below shows a dry grinder as used for grinding brass casting equipped with a sheet metal belt guard A, of sufficient height to protect the workmen from the belt in case it should break. This sheet metal guard is made from galvanized sheet iron. B is a heavy sheet iron hood strong enough to withstand the shock of a bursting wheel and to it is fastened cap C to guard the spindle end and nut. To the hood is also fastened exhaust pipe G to carry away the brass dust which accumulates and D is a glass shield to protect the operators



SAFETY GUARD ON DRY GRINDER.

eyes from the fine dust. E is a safety flange and F an adjust-rest permitting close adjustment to the wheel.

The wet grinder is also provided with a sheet metal guard high enough to protect persons passing along side of the machine; there is a heavy sheet iron hood over the wheel with an adjustable hood or front shield to protect or arrest flying particles from the wheel. This shield is adjusted by means of a set screw and slotted pole.

Both of these machines were unprotected before the Compensation Act went into effect. It is necessary many times to use force in order to make a man leave a safety device on his machine, because he imagines that it will retard his output and reduce his piece-work earnings. For a few cents more per day he is willing to take the chance of maiming himself for life. After an operator uses the safety device long enough to become familiar with its working and learns that he is safer while it is on the machine it gives him more confidence.

COPPER CYANIDE SOLUTIONS

A Comparison Between the Modern and the Old Methods of Preparing These Copper Salts.

By W. H. Weber.*

The copper cyanide plating solution needs but few words of introduction. It is a solution which is relatively easy to manipulate, having but few ailments for which, by careful study, the average plater should be readily able to apply antidotes. The ideal solution gives such good work and so little trouble that it is seldom that one ever stops to think of the intricate and perplexing chemical reactions occurring within continuously. The purpose of this article is to lift the veil for a moment and seek a passage through the labyrinth of chemical reactions.

Primarily, in preparing or replenishing with metal a copper cyanide solution, from a theoretical viewpoint the best metal salt to use is copper cyanide. This becomes very clear when we examine the following equations of reaction:

Method 1. Copper Cyanide.

$$CuCN + NaCN = NaCu(CN)_2 \text{ directly.}$$

From their molecular weights we see that 49.09 grams sodium cyanide react with 89.64 grams cuprous cyanide to form 138.73 grams of the complex salt sodium cuprous cyanide the ultimate desired product. Based on 100 pounds copper consumed this becomes: 77.46 pounds sodium cyanide will convert 141.44 pounds cuprous cyanide (contains 100 pounds copper) into 210 pounds sodium cuprous cyanide. Now let us turn to the more common method, that of using copper carbonate.

Method 2. Copper Carbonate.

In this method complications arise at the start.

1st Step. $CuCO_3 + 2NaCN = Cu(CN)_2 + Na_2CO_3$; that is, sodium cyanide added to a cupric salt precipitates cupric cyanide, which, however, is not stable, but breaks down into the water insoluble cuprous cyanide and gives off cyanogen gas, which is very evident to the man who has cut up copper carbonate.

2nd Step. $2Cu(CN)_2 = 2CuCN + C_2N_2$.

Assuming now that we have no excess of sodium cyanide present, we have a state of equilibrium.

CuCN (solid), CuCN (dissolved), the reaction bearing strongly to the left. The product of the concentrations of the Cu and CN ions is a constant. Let a = concentration of Cu ion and b = concentration of CN ion, then ab = k. Upon adding an excess of sodium cyanide we would naturally expect more CuCN to precipitate out since a precipitate is more insoluble, generally, in the presence of the excess of one of its ions, but in this case we form a complex salt.

3rd Step. $CuCN + NaCN = NaCu(CN)_2$, which splits into the ions Na and $Cu(CN)_2$. The CN ion unites with the Cu to form another ion and the concentration product becomes less than the constant k (ab < k), and CuCN must dissolve to obey Guldberg and Waage's Law of Mass Action. Now combining these three steps into one equation, we get the following:

$$4NaCN + 2CuCO_3 = 2Cu(CN)_2 + 2Na_2CO_3$$
$$2Cu(CN)_2 = 2CuCN + C_2N_2$$
$$2CuCN + 2NaCN = 2NaCu(CN)_2$$
$$6NaCN + 2CuCO_3 = 2NaCu(CN)_2 + 2Na_2CO_3 + C_2N_2$$

From their molecular weights this equation shows us that 294.54 grams sodium cyanide react with 247.2 grams copper carbonate to form 277.46 grams sodium cuprous cyanide, or 222.81 pounds sodium cyanide will convert 187 pounds copper carbonate (containing 100 pounds copper) into 210 pounds sodium cuprous cyanide. Summing up results of both methods, we get:

$$141.44\ CuCN + 77.46\ NaCN = 210\ NaCu(CN)_2$$
$$187\ CuCO_3 + 222.81\ NaCN = 210\ NaCu(CN)_2$$

These figures, theoretically correct, do not hold in practice, however.

In order to compare actual and theoretical values the following experiments were carried out. Definite amounts of cuprous cyanide and copper carbonate were weighed out and an excess of standard sodium cyanide solution was added to each sample. The excess cyanide over that required to convert the copper salts into sodium cuprous cyanide now existing as free cyanide was titrated with $\frac{N}{10}$ silver nitrate solution and the amount of cyanide necessary to dissolve each sample was calculated by difference.

Exp.	Chemical.	%Cu.	Gms. Taken.	(A) Added ccNaCN=gmsNaCN	(B) Titration ccAgNO$_3$=gmNaCN	A-B.	Ratio Chemical:NaCN		Av.
1.	CuCNR&H	70.7	.0346	25 .33095	30.19	.29647	.03448	1.00	1.00	1.06
2.	CuCNR&H	...	.0310	25 .33095	30.04	.29499	.03596	1.00	1.16	
3.	CuCNJ.T.B.	70.7	.0364	25 .33095	29.75	.29214	.03881	1.00	1.07	
4.	CuCNJ.T.B.	...	.0300	25 .33095	30.60	.30049	.03046	1.00	1.01	
5.	CuCO$_3$J.T.B.	54.2	.0386	25 .33095	28.03	.27525	.05570	1.00	1.44	1.45
6.	CuCO$_3$J.T.B.	...	.0364	25 .33095	28.19	.27683	.05412	1.00	1.49	
7.	CuCO$_3$com	53.5	.0366	25 .33095	28.34	.27830	.05265	1.00	1.44	
8.	CuCO$_3$com	...	.0394	25 .33095	27.95	.27447	.05648	1.00	1.43	

Following are the results of the experiments:

From the ratios we see that one pound of cuprous cyanide requires 1.06 pounds sodium cyanide, whereas one pound copper carbonate requires 1.45 pounds sodium cyanide. If we calculate the values of sodium cyanide required to react with definite weights of cuprous cyanide and copper carbonate calculated to contain 100 pounds metallic copper, we get the following results:

$$149.93\ NaCN \text{ react with } 141.44\ CuCN$$
$$271.15\ NaCN \text{ react with } 187.00\ CuCO_3$$

A calculation of costs based on these figures and not on the theoretical values gives the true comparison in running costs of the two methods.

Now that we have our solution made up, let us consider some of the reactions in the tub. S. Field in his book on electroplating gives a very clear description of the ionization of $NaCu(CN)_2$ through the electric current and of the secondary nature of copper deposition, but for convenience I shall repeat the ex-

*Chemist Waterbury Clock Company, Waterbury, Conn.

planation here. $NaCu(CN)_2$ splits up into the ions Na and $Cu(CN)_2$, the sodium going to the cathode where it displaces copper from more $NaCu(CN)_2$ the copper plating on the cathode.

$Na + NaCu(CN)_2 = Cu + 2NaCN$, while the negative $Cu(CN)_2$ ion goes to the anode, where it unites with anodic copper to form cuprous cyanide.

This explanation is simple and convincing enough for a broad and general view, but when one considers it more deeply, several questions arise. In a hot water solution can a sodium ion exist even for an infinitely short time without reacting with the hydroxyl ion of water; can $Cu(CN)_2$, which is very unstable in the molecular state, exist as the ion without losing some of its cyanide; how shall we account for the black so-called "oxide" which forms on the anodes when solution is low in free cyanide? These are all questions with which the average plater does not worry himself. Nevertheless, for an explanation of some of the peculiarities of the cyanide solution—it must be kept in mind that these faults can be corrected without a knowledge of their cause—it is absolutely necessary to consider every possible loophole for side reactions. The above equations intimate automatic control of free cyanide, for as soon as the copper is deposited more cyanide forms. According to this theory, the solution should run itself as long as there is a feed supply of anodic copper and current for deposition. An ideal solution will feed itself from its anodes, but every plater knows that he must add cyanide from time to time, and he also knows that mechanical loss will not account for the consumption of all the cyanide he puts in; in fact, the mechanical loss is but a small percentage of the total loss.

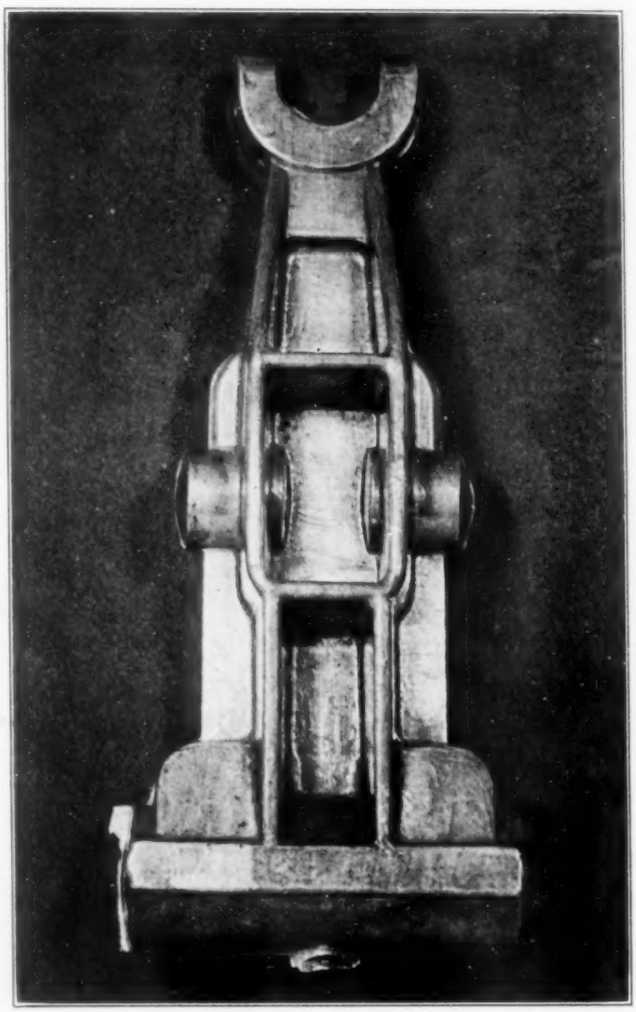
Let us examine what is present in our solution. There are $NaCN$,$NaCu(CN)_2$,Na_2CO_3,CN,HOH,Na,OH, H_2,C_2N_2,$Cu(CN)_2$,HCO_3, and some minor inert salts in small quantities. NaCN and Na_2CO_3 are salts of weak acids and therefore hydrolize; water hydrolizes to a very small extent possibly, just enough to give small traces of HCN and to form NaOH. From the fumes from the hot solution we know that cyanogen gas is given off constantly. This would lead us to suspect that the ion $Cu(CN)_2$ does lose some of its cyanogen charge. This loss added to the mechanical loss would more nearly account for the immense amount of cyanide required. However, this does not account for the sodium of the cyanide. The cyanide is added very frequently to a solution constantly in use, but the solution is rarely if ever thrown away. In time the concentration of the sodium ion becomes very high and the solution becomes rich in sodium hydroxide which has but one good function—its cleaning action. Its evil function is the formation of the black "oxide" which covers the anodes and gives so much trouble in rough work. The composition of the oxide is probably $Cu(OH)_2 2CuO$, and is formed as follows:

$$Cü + 2OH = Cu(OH)_2$$

$3Cu(OH)_2 = Cu(OH)_2 2CuO + 2H_2O$ and is a hydrated copper oxide. It dissolves slowly in an excess of cyanide. From this it is evident that the removal of excess sodium would go far to eliminate the greater percentage of copper cyanide plating solution troubles but, unfortunately, there is but one method available at present to correct the evil, viz., the addition of barium cyanide and subsequent filtration.

If the price of barium cyanide would come down to within reasonable bounds, or if some ingenious chemist could manufacture cheaply another cyanide salt which would precipitate hydroxides and carbonates, every plater could run an ideal cyanide solution by preparing his first solution from any reasonable copper salt, feeding his solution with sodium cyanide only and precipitating and filtering off the inert salts whenever the specific gravity would attain a certain point, assuming that he knows definitely the content of copper and free cyanide. He could determine this point by taking a sample at such a time when the contamination interferes with the deposition of the copper, noting the specific gravity and temperature for future reference and having the sample analyzed for sodium. Or, better stiil, a series of curves might be constructed with the content of copper and free cyanide for abcissas and varying amounts of excess sodium as ordinates giving the temperature and specific gravity at various points. From the analysis the amount of barium or other precipitating cyanide necessary to precipitate the hydroxides and carbonates calculated from the difference between total sodium and sodium required for cyanide and cuprous sodium cyanide in solution can be calculated.

ALUMINUM DROP FORGING.



AN ALUMINUM DROP FORGING MADE AT UNITED STATES NAVY YARD, WASHINGTON, D. C. THE MIXTURE IS ALUMINUM 97%, COPPER 2%, MANGANESE 1%. THE MANNESE USED IS CARBON FREE, FURNISHED BY THE GOLDSCHMIDT THERMIT COMPANY. THE PHOTO IS ACTUAL SIZE.

THE FAILURE OF STRUCTURAL BRASSES*

BEING A REPORT OF INVESTIGATIONS MADE AT BUREAU OF STANDARDS, WASHINGTON, D. C.

P. D. MERICA AND R. W. WOODWARD.

(Concluded from November.)

It seems then that failures in brass materials similar to season cracking are due primarily to the presence of these internal stresses, and it should be the object of the manufacturer to produce material which is free from them[11] and yet preserves in as great measure as possible those physical properties produced by the mechanical treatment which is at the same time responsible for the internal stresses. Some idea of the extent to which material, sound in this respect, is and can be manufactured, can be obtained by a comparison of Tables I and II. In Table I are given values for the internal stresses in various new

TABLE II.

PHYSICAL PROPERTIES AND CHEMICAL ANALYSES OF BRASS MATERIALS.[a]

B. S. No.	Copper.	Zinc.	Tin.	Lead.	Iron.	Manganese.	Ultimate strength lbs. per sq. in.	Elastic limit lbs. per sq. in.	Elongation %	Reduction of Area %
3	60.0	38,6	0.78	trace	0.55	trace	70,000	17,000	33	45
22	56.6	40.8	1.16	trace	1.36	0.03	.....	....	..	..
23	56.4	40.9	1.25	trace	1.43	0.03	.....	....	..	..
28	58.1	39.7	0.91	trace	1.33	trace	69,500[b]	17,500[b]	33[b]	35[b]
32	56.8	40.5	1.14	trace	1.50	.02	68,000[b]	18,000[b]	40[b]	44[b]
34	56.8	40.6	1.10	trace	1.47	0.03	.....	...	.	..
41	56.4	40.7	1.15	trace	1.71	0.03	.	.....	...	...
43	56.4	40.8	1.02	trace	1.71	0.03	.....	...		..
49	58.3	40.2	0.76	trace	0.76	trace	.....	.....	...	...
54	58.6	39.9	0.72	trace	0.76	trace	72,000[b]	35,000[b]	34[b]	36[b]
67	58.3	40.2	0.78	trace	0.72	none	71,500[b]	26,000[b]	34[b]	39[b]
68	56.6	41.5	0.90	trace	0.94	none	.....	....		...
74	58.9	39.5	0.8	trace	0.8	trace		.....	.	...
83	60.9	38.3	0.61	0.17	trace	none	59,650[c]	30,150[c]	50[c]	...
85	59.8	39.3	0.67	0.16	trace	none	61,900[c]	34,200[c]	47[c]	...
92	60.9	38.3	0.61	0.17	trace	none	60,000[c]	35,900[c]	47[c]	...
94	59.8	39.3	0.67	0.16	trace	none	61,900[c]	33,500[c]	43[c]	...
101	60.9	38.3	0.61	0.17	trace	none	57,800	31,250	44	...
103	59.8	39.3	0.67	0.16	trace	none	62,000	33,500	43	47
129	59.2	38.8	0.97	trace	1.0	trace	79,000	25,000	23	43
133		Monel metal				.....	95,500	42,500	35	64
136	59.1	39.3	0.78	0.13	0.70	0	72,000	27,500	44	50
156	61.06	38.2	0.72	trace	trace	none	55,500	9,500	43	52
157	61.2	38.0	0.78	trace	trace	none	55,000	14,000	41	31
158	57.9	40.4	0.74	trace	1.0	none	66,000	32,500	30	41
159	57.6	40.5	0.87	trace	1.08	.....	.....	...	...	...
160	57.3	40.7	0.94	trace	1.08	.....	61,000	14,000	28	30
161	58.4	39.8	0.83	trace	0.94	.....	67,500	23,000	25	34
162	60.3	39.1	0.60	trace	.....	.....	65,000	40,000	28	49
163	60.3	39.1	0.53	trace	.....	.....	61,000	34,000	25	45
164	61.12	38.47	...	0.36	0.05	.....	72,000	40,000	16	50
165	62.31	36.87	0.72	0.07	0.03	.....	56,000	27,500	40	54
166	61.10	38.56	...	0.29	0.05	.....	61,000	37,000	32	52
167	60.05	39.12	0.76	0.05	0.019	.....	82,000[c]	59,500[c]	17.5[c]	35[c]
168	60.52	38.59	0.76	0.10	0.026	.....	65,300[c]	45,400[c]	32.8[c]	45[c]
169	61.21	37.53	1.15	0.08	0.034	.....	93,500[c]	62,500[c]	9.5[c]	20[c]
170	61.26	37.39	1.21	0.10	0.032	.....	67,450[c]	42,400[c]	28.5[c]	38[c]
171	59.40	40.25	...	0.33	0.023	.....	81,200[c]	54,400[c]	18.5[c]	40[c]
172	59.44	40.19	...	0.35	0.019	.....	65,150[c]	41,800[c]	36[c]	50[c]
173	56.85	39.92	1.63	0.106	1.27	0.22	102,300[c]	62,900[c]	10[c]	17[c]
174	56.90	40.07	1.63	0.070	1.18	0.14	85,550[c]	54,300[c]	21.8[c]	26[c]
175	57.5	40.9	1.0	trace	0.6	trace	77,000	26,000	27	27

[11] That is, containing no stresses greater than about 1,000 to 2,000 lbs. per sq. in. in value.

*A paper presented at the annual meeting of the American Institute of Metals, September 28 to October 1, 1915, at Atlantic City, N. J.

[1] A full account of this investigation will be published as a technologic paper of the Bureau of Standards.

a. These materials have all been tested as received, and no heat treatment has been given them other than that which they were given during their manufacture.

b. These determinations were made on samples of same lot, but not on actual material opposite which the results are placed.

c. These values were furnished by the manufacturers, and have not yet been checked out at the Bureau.

and used materials, whose physical properties and chemical analyses are given in Table II.

It is seen that it is possible to make naval brass (samples 83, 85, 92, 94, 101, 103) practically free from internal stress with an ultimate strength of 60,000 pounds and an elastic limit[12a] of from 30,000 to 35,000

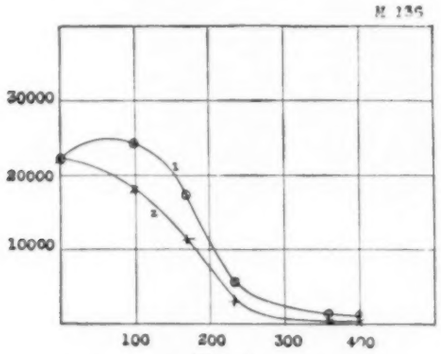


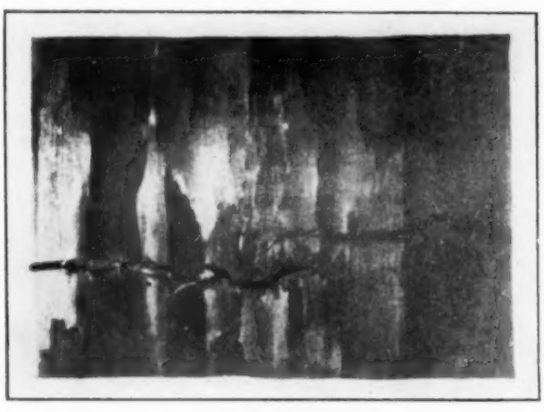
FIG. 2.

EFFECT OF ANNEALING UPON INITIAL STRESSES IN BRASS.

Abscissas—Temperature of Annealing in °C.
Ordinates—Average Initial Stress Remaining After Annealing.
Curve 1—Annealing for 1 Hour.
Curve 2—Annealing for 7 Hours.

pounds. The best manganese bronze tested was No. 174, which, with average internal stress of 3,380 pounds per square inch, still possessed an ultimate strength of 85,500 pounds, an elastic limit of 54,300 pounds, with an elongation of 21.8%.

For the sake of comparison there are here included the results of tests on a rolled bar of Monel metal, No. 133, which is used a great deal as a structural material which will withstand corrosion. It is seen to be

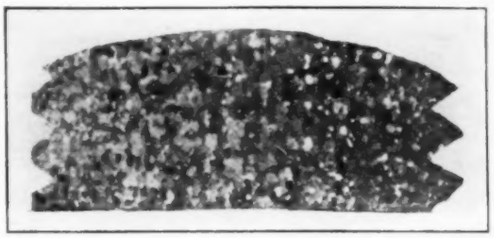


SPECIMEN 161. 2 DIAMETERS. LARGE ELONGATED BETA GRAINS.

superior to any of the brasses tested, possessing high physical properties, associated with low initial stresses.

EFFECT OF MODE OF MANUFACTURE AND HEAT TREATMENT ON THE PROPERTIES AND INITIAL STRESSES OF BRASS.

The specimens 83, 92, 101 and 85, 94, 103 are from the same heats respectively and have merely been differently manufactured. Nos. 83 and 85 were plain extruded, Nos. 92 and 94, cold drawn, and Nos. 101 and 103, cold drawn and annealed. It can be seen that there is little difference in the properties of the materials shaped in the different ways. Strangely enough,

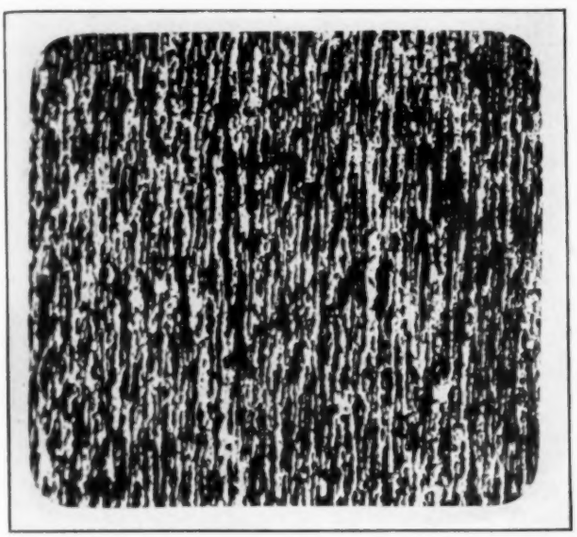


SPECIMEN 50. 3 DIAMETERS. LARGE POLYHEDRAL BETA GRAINS

the annealed material is the most highly stressed of all. The four materials, 167-174, are all from the same manufacturer, each material having been finished in two ways. Nos. 167-168 are a naval bronze,

SPECIMEN 58. 3 DIAMETERS. FINE ELONGATED BETA GRAINS.

169-170 a naval brass, 171-172 a Muntz metal, and 173-174 a manganese bronze. Nos. 167, 169, 171 and 173 are cold drawn to size without annealing, whereas 168, 170, 172 and 174 have been annealed before the final draw. The effect of this one annealing operation in lowering the stresses in the rods is striking. No. 169



SPECIMEN 83. 50 DIAMETERS. ELONGATED ALPHA AND BETA GRAINS.

was so badly stressed that mere immersion in a tank of water for about two weeks caused it to crack longitudinally, whereas 170 did not crack under the same treatment and is a safer material, though in view of its

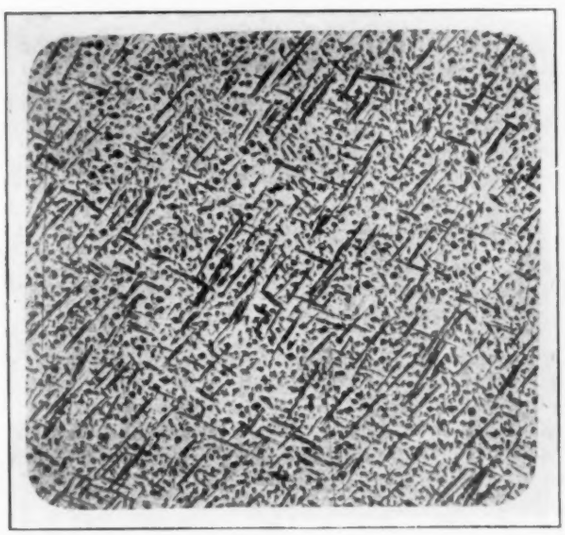
[12a] This is determined by the firm furnishing this material in the following way: "Our operator holds the points of a compass in the prick punch marks which are exactly 2 inches apart and records the tension at the point where the elongation first shows itself."

5,400 pounds per square inch average stress it is not entirely free from danger of season cracking.

Experiments were made to discover what annealing temperatures and periods were necessary in order to relieve internal stresses in these materials.[18] In Fig. 2 are given curves showing the effect of one and of seven hours' annealing respectively on the average internal stress of a manganese bronze rod. It is seen that a temperature of 300°C is amply sufficient to reduce in from one to seven hours the stresses to a safer value. The physical properties of this same material were determined before and after annealing for one and for seven hours at 400°C, and are given below.

	Ultimate strength lbs. per sq. in.	Elastic limit lbs. per sq. in.	Elongation %	Reduction of Area %
Material before annealing	72,000	27,500	44	50
Material after annealing for 1 hour at 400°c....	72,500	35,000	33	49
Material after annealing for 7 hours at 400°C....	71,000	32,500	37	50

It is, therefore, possible to entirely relieve these internal stresses by annealing at temperatures which do not affect the physical properties.



SPECIMEN 159. 50 DIAMETERS.

Another specimen, No. 23, was annealed for 30 minutes at 600°, with the results shown below:

	Average stress lbs. per sq. in.	Maximum tension lbs. per sq. in.	Maximum Compression lbs. per sq. in.
Material before annealing	15,400	24,500	31,600
Material after annealing.	3,000	11,000	16,500

This shows that annealing for a short time at a high temperature may not be as effective as that for a longer time at a lower temperature.

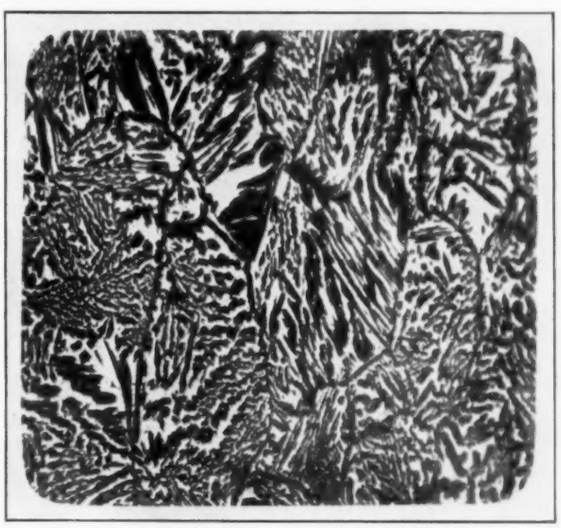
THE EFFECT OF ETCHING REAGENTS ON INTERNALLY STRESSED BRASSES.

When a brass article which contains initial stresses is treated with a solution of mercuric chloride, mercurous nitrate, or ammonium hydroxide, cracks are very often produced, appearing in from two minutes to 24 hours. It has been suggested that such an acceleration test might be used as a quick and convenient criterion of the soundness of brass articles.

In order to determine how closely cracking under such circumstances is related to service failures and to the magnitude and distribution of internal stresses, two-inch specimens of all of those materials upon which stress measurements had been made were immersed for four hours in a N/4 solution of mercurous nitrate. Of all of these only Nos. 3, 136, 158, 160, 167, 169, 171, and 173 were found cracked after such treatment. Those which had 30,000 pounds or more tension at the surface cracked, while the others, including those which had large compression values at the surface remained unchanged. Apparently then the mercurous nitrate test is not a sufficient one, for it will not enable one always to detect defective material.

THE MICROSTRUCTURE.

The macro- and micro-structure of the brasses studied, although the same in type, is so varied in respect to the size and distribution of the alpha and beta grains composing the structure that no adequate idea of its variation can here be given. A few typical examples are given in micro-photographs 1 to 6. These photographs are of longitudinal center sections, etched with ammoniacal cupric ammonium chloride.



SPECIMEN 171. 50 DIAMETERS.

The microstructure gives apparently no certain indication of the magnitude of the internal stresses in a specimen. A structure such as is shown in No. 4 would seem to be indicative of extensive cold work and internal stresses, yet the stresses in this specimen, 83, are in reality small, whereas those in Specimen 171, of which the structure is shown in No. 6, are very large.

The variation of microstructure, grain size, etc., from center to edge gives also no certain indication of the stress values. Some highly stressed specimens showed a uniform structure from center to edge, whereas others with very small stresses showed a characteristic cold-worked structure at the edge and an annealed structure at the center.

Large beta grains, elongated, such as are noticed in Photograph 1, seem to be associated with internal stresses and season cracking, although many highly stressed specimens did not have such a structure.

SUMMARY AND CONCLUSION.

The principal results which have been obtained so far in this investigation are the following:

1. Season cracking and similar failures occur in brass

[18] A few such experiments have been made by Heyn, Journ. Inst. Metals, 1914.

materials which are under initial stress, provided these stresses average over 5,000 to 6,000 pounds per square inch.

2. These stresses may be almost entirely removed by annealing at temperatures of about 300°C to 400°C, which temperatures do not affect sensibly the ordinary physical properties.

3. No certain indication of the magnitude or even presence of such stresses has so far been found in a study of (a) the action of etching agents, such as $HgNO_3$ or NH_4OH on brass, or (b) the micro- or macro-structure.

4. Brass may be manufactured practically free from stresses, and which still retains excellent mechanical properties, i.e., is not too soft.

Thus it would seem that from the standpoint of the user of brass further investigation should continue to correlate the service behavior of brasses with their physical properties and initial stresses such that it may finally be possible to decide what is the magnitude and the distribution of initial stresses which are allowable in such materials. Further, the most convenient method of measuring or obtaining an indication of the value of these stresses should be sought. At present this is the elongation method used in this investigation and it is a fairly tedious one.

From the standpont of the manufacturer, investigation should concern the influence of the mode of manufacture on the initial stresses, the influence of other chemical elements in producing hot or cold shortness, and a study of the best manner of annealing such materials. Namely, to anneal brass at 300° to 400° is not convenient with the ordinary brass rolling mill equipment, and it is possible that some higher temperature might be used, without softening the material unduly.

Investigation along these lines will be continued at the Bureau of Standards and the co-operation of both manufacturers and users of brass is invited, and will indeed be much appreciated.

The authors desire to express their thanks to Mr. A. B. Lort for making the chemical analyses and to Mr. R. P. Devries for determining the physical properties.

FOUNDRY VENTILATION*

A Description of Recent Improvements in Foundry Practice for the Benefit of the Health of the Foundry Employee.

Foundry buildings are usually large and high, with a great amount of window space available for ventilation, and each foundry employee is provided with more floor area than is ordinarily allotted to workmen in many other occupations. The advantage of much working and breathing space, however, is offset in more or less degree by factors that tend to vitiate the air. The fumes thrown off from molten metals which contain zinc, may injuriously affect the health of workmen. Much objectionable smoke sometimes arises from the core ovens or from moulds containing cores in those foundries where the amount and size of the cores is comparatively large. Fumes arise also from acids employed in the cleaning and pickling of castings. All foundries are also confronted more or less with the dust problem, which is particularly aggravated in cleaning departments and in sand-blasting rooms.

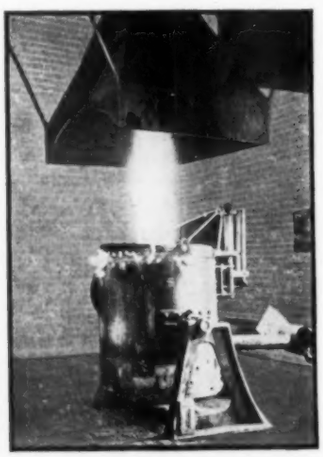


FIG. A. TILTING FURNACE WITH INDIVIDUAL HOODS.

For all of these conditions practical remedies have been found and put into service. This has been accomplished sometimes by effective natural ventilation, sometimes by a system of forced draft either for general ventilation or for the ventilation of individual rooms or particular furnaces or machines. Improvements in the combustion of fuel or the use of practically smokeless core binders has often eliminated the necessity for more than ordinary ventilation. Cleaning room floors of brick, concrete or wood blocks can be more easily kept free of excessive dust than floors of clay; an occasional sprinkling of the floors helps materially to keep down the dust. In certain classes of work where it is impossible otherwise to secure satisfactory relief from fumes and dust, workmen are provided with respirators or other health protective devices.

FIG. B. FURNACES WITH INDIVIDUAL RIGID HOOD.

Natural ventilation is most frequently employed because it is most economical and in many cases fills all requirements. Open windows in the lower part of the building allow the entrance of enough fresh air to drive the impure air up and out through open windows usually located in the monitor. Where, however, the roof is comparatively flat, there is a tendency of smoke or steam

* From Bulletin Number 30, National Founders' Association.

to remain in low hanging clouds, even when the windows are open.

In some cases the smoke developed in the foundry is so excessive that the amount of natural ventilation required for its removal creates drafts that are objectionable to workmen, especially on cold days. To overcome this

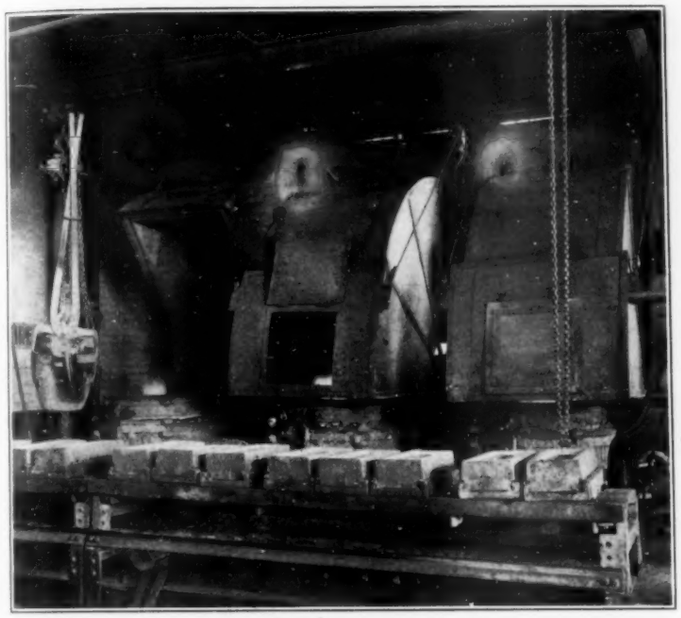


FIG. C. RIGID FURNACES WITH INDIVIDUAL TELESCOPIC HOODS.

difficulty, the heating apparatus is located alongside of small openings in the wall where the heated air intercepts

FIG. D. EACH HOOD SERVES THREE FURNACES

and tempers the cool air as it comes into the building, or the lower windows are slanted so as to deflect incoming air upward thus avoiding a direct draft on the workmen. Sometimes it is sufficient to open the windows during the pouring and smoky period only.

In foundries in which metal is being poured several times during the day or where the pouring operation is practically continuous, smoke or steam is constantly generated, and measures are therefore required to provide constant relief. This situation is usually met by the installation of a system of forced draft with openings so located as to discharge fresh air into the room, cool in summer and warm in winter, at about or a little below the breathing zone; of course, suitable outlets, usually located in the monitors, must also be provided.

Where foundry operation develops unusual quantities

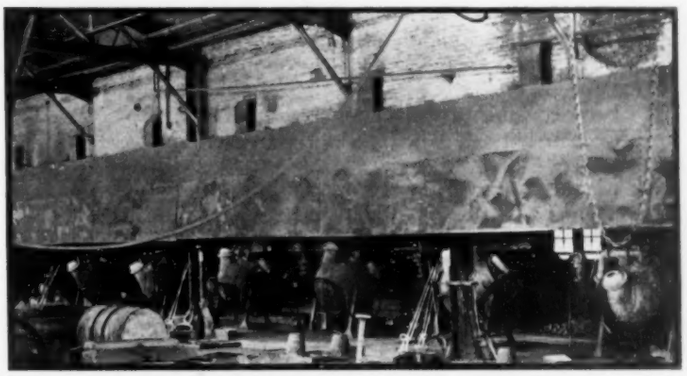


FIG. E. A LONG HOOD SERVES A NUMBER OF FURNACES; EACH FURNACE VENTILATED BY AN INDIVIDUAL STACK.

of fumes, ventilating hoods are installed at specific points to supplement the general ventilation. These hoods are found particularly in connection with brass furnaces, core ovens and various kinds of heaters and dipping tanks. In some instances each hood serves a single furnace, oven, heater or tank, while in others large hoods extend over groups of such apparatus. The individual type has usually proved to be most efficient.

Figures A and B illustrate individual hoods of simple

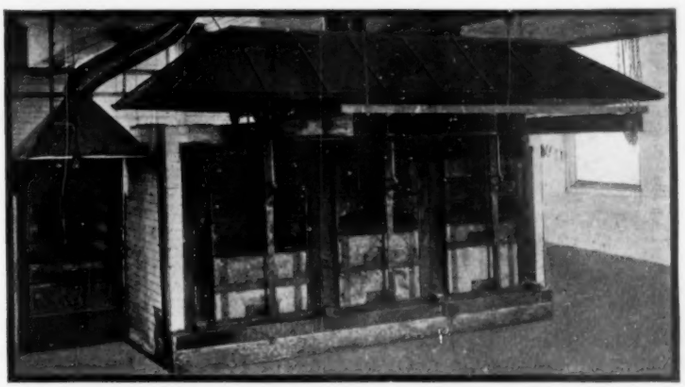


FIG. F. CORE OVENS WITH HOODS.

design, suitable for use with brass furnaces of the tilting type.

Figure C illustrates three individual hoods, each of which is made in three sections. The wall section is rigid and is connected at its rear to an individual stack; when necessary to make room for use of hoist for placing or removing crucibles, the other two sections, which telescope over each other and the rigid section, are raised out of the way. When lowered, the bottom sections of the hoods are close to the furnace tops and prevent escape of fumes into the room.

Figure D illustrates two hoods of the group type, each of which serves three tilting furnaces; in this case

the metals melted are low in zinc content, and the two hoods have proved adequate to keep the air free of objectionable fumes.

Figure E illustrates a hood serving a number of furnaces; each furnace, however, is provided with an individual stack.

Figure F shows hoods for ventilating core ovens.

In many cases, it has been found that the excessive smoke from core ovens was due to imperfect combustion of fuel oil, which in turn was caused by unsuitable burners or their improper adjustment. In coke or coal fired ovens the difficulty has often been traced to flues that were faulty or limited in size or clogged with soot. The improvement in foundry ventilation resulting from attention to these simple details has been surprisingly effective. Figure G shows two of the many hundreds of hoodless core ovens that have been rendered practically smokeless by securing proper combustion and draft.

An important factor in the prevention of smoke from cores either while they are in the ovens or in the moulds, is the character of the core binder in use. It is well known that flour, resin and some core oils abound in smoke producing elements. Many foundrymen have cleared their

FIG. G. CORE OVENS WITHOUT HOODS, YET PRACTICALLY SMOKELESS.

foundries and core rooms of this aggravating smoke nuisance by substituting for these materials readily available core binders that will not develop smoke to any great extent. The use of mechanical devices for mixing core sand with binders also lessens the amount of smoke thrown off from cores, as the more thorough mixing requires a smaller amount of the binder; the less binder used, the less resulting smoke.

Where, on account of the large size of the cores and the character of the castings, the objectionable smoke cannot be avoided, it has been found to be good practice to place such molds at one end of the foundry or even in a separate room and to pour the smoky molds at one end of the foundry or even in a separate room and to pour the smoky molds last so as to isolate the smoky molds and confine the smoky condition to a short period at the very end of the day.

Another cause of smoke in foundries lies in the practice of drying ladles by making wood fires in them. Modern practice obviates this smoke nuisance by the use of specially constructed ladle heaters for drying small ladles; one of these heaters is illustrated in Figure H. Large ladles, on the other hand, are dried in core ovens or in other well ventilated places where the smoke will not foul the foundry air.

Moreover, the amount of smoke in foundries is reduced by careful preparation of cupola fires and by thoroughly cleaning of castings, the knocking out of cores and by mechanical cleaning operations, as in the tumbling machine process

Sometimes excessive fumes are caused by burning high sulphur coke or coal in salamander stoves, which are frequently used in foundry buildings for temporary heating purposes; even when low sulphur fuel is used, the gases may prove objectionable, especially to cranemen or others working in high positions. A proper hood placed over the salamander stove will take care of the situation. The chief advantage of this arrangement lies in the counterweighted adjustable hood which slides up on the stack to permit feeding of fuel into the stove, but is afterward lowered to trap the gas and carry it out through the roof. Usually a number of stove pipe openings are made in suitable places in the roof, each provided with a cover

FIG. H. LADLE HEATER WITH HOOD.

for use when the stoves are out of commission; in this way the salamander stoves can be moved to various places in the foundry and readily be connected with ventilating stacks.

Especially good ventilation is required in dipping and pickling rooms to guard the health of workmen; this should not be neglected even though workmen wear suitable respirators. When the construction of these rooms is such that ventilation from open windows does not suffice, artificial ventilation is secured through the use of fans, either placed in wall or window openings or connected with ventilating hoods.

The dust in the foundry is an important factor in foundry ventilation. The dust is usually not objectionable in molding or core rooms, except in isolated instances where castings are poured only once or twice a week, and fine sand becomes dry meanwhile and floats as dust in the air. Occasional sprinkling of the floors provides an effective remedy.

BRONZING PROCESSES SUITABLE FOR BRASS AND COPPER*

AN INTERESTING COLLECTION OF FORMULAE FOR THE ELECTRO-PLATER.

BY T. I. BAKER, SR.

(Concluded from November.)

KHAKI COLOR UPON BRASS SUITABLE FOR MILITARY ORNAMENTS.

	Per Mr. Coleman.		
	Light	Medium	Dark
Copper chloride	8 oz.	6 oz.	4 oz.
Copper sulphate	4 oz.	6 oz.	8 oz.
Ammonium chloride	4 oz.	4 oz.	4 oz.
Water	160 fluid oz.	160 fluid oz.	160 fluid oz.

Boil the solution before use, but use it cold. After coloring, immerse the work in boiling water during a few seconds. If the hot water bath is omitted, the work will blacken on exposure to daylight. Lacquer.

Metallochromes, Nobilis Rings.—The solution is made as follows:

Potassium hydroxide .	1.5 ounce.
Litharge . . .	1 ounce.
Water . . .	20 fluid ounces.

Boil during thirty minutes. Decant clear solution, and dilute with water to a volume of forty fluid ounces. Use cold.

The work to be colored is made the anode, and the free end of the negative wire, held in the solution just short of touching the work, serves as cathode. The potential difference between the terminals of the bath may vary between two and six volts.

Lead is deposited upon the wire cathode, and lead peroxide upon the work or anode.

The film of peroxide diminishes in thickness from the centre outwards; but is everywhere so thin as to be permeable to light, which, being reflected from the anterior and posterior surfaces of the film, produces interference and gives birth to concentric rings of prismatic colors. The more highly the work is polished, the more brilliant the colors will appear.

Highly polished nickel plated surfaces yield the best results.

Color Films sensitive to Light.—In a cold 20 per cent. solution of copper chloride, brass assumes a brown ochre color and copper is colored "salmon red." On exposure to bright sunlight, both colors will blacken in the course of a few minutes. In diffused daylight they may blacken in the course of a few hours' exposure. This property can be utilized to print photographs from negatives upon colored copper plates. Such photographs might be useful to engravers; but, unfortunately, we do not know how to "fix" them, and therefore the artist would have to work by artificial light if he wished to make use of them.

Brass work after coloring may be coppered by being gently heated upon a hot copper plate or in a gas oven.

The copper coating may be brightened by scratch brushing.

Sensitive color films were known sixty years ago. In 1854 Carlemann observed that when a copper plate was suspended over chlorine water it underwent a series of color changes, and became sensitive to light. He stated that certain other metals, e. g., zinc, iron, and tin, behaved similarly.

Dr. Prwosnik (1859) found that a copper plate slightly amalgamated in a dilute solution of mercuric chloride, and then exposed to air, lost its mercuric coating, and became sensitive.

Meldola (December 3, 1892), in answer to an inquiry, expressed the opinion that the color-film is probably composed of cuprous chloride or oxychloride, or of a mixture of both compounds. He also referred to the work of Obernetter, who transferred silver prints to copper plates for engraving. Finally, it has been observed that copper vessels cleaned with hydrochloric acid blacken in sunlight (1864).

The concluding section of the paper dealt with the results of experiments made with the object of determining—

(a) The weight per unit area of certain color films.
(b) The loss of metal per unit area incurred in the coloring process.

The color films were readily soluble in a dilute solution of sulphuric acid or of potassium cyanide, while the underlying metal was not sensibly attached by either reagent. Three weighings were made in each case, namely—

1. When the metal was clean and dry.
2. After coloring.
3. After stripping.

The difference between the second and third weighings gives the weight of the color film. The difference between the first and third weighings gives the loss of metal incurred in the coloring process.

Film.	Weight of Film in Milligrams Per Square Decimetre.	Loss of Metal Due to Coloring Process in Milligrams Per Square Decimetre.
Black film (CuO) produced by dipping in solution of copper nitrate and heating upon hot copper plate.	99 milligrams (mean of 3 experiments).	44 milligrams (mean of 4 experiments).
Black film (CuO) produced by immersion in a cold solution of copper-ammonium carbonate.	37 milligrams (mean of 2 experiments).	87 milligrams (mean of 3 experiments).
Film (Cu_2O) produced by immersion in a hot solution of copper nitrate.	50 milligrams (mean of 2 experiments).	83 milligrams (mean of 2 experiments).
Brown ochre film produced upon brass by immerison in a hot solution of copper chloride.	21.5 milligrams.	77 milligrams.
Black film (NiS) produced by the black nickeling process.	35.5 milligrams	

It is thus seen that the weights per unit area of the color films dealt with are surprisingly small. Sixty-two milligrams per square decimetre was the mean result of eight determinations, and this corresponds approximately to nine grains per square foot.

It was also noticed that brass trays colored by either of the first four methods in the table exhibited a coppered surface on being stripped with dilute sulphuric acid, while when stripped in a solution of potassium cyanide no evidence of coppering appeared.

(The End.)

*Paper read before a recent meeting of Birmingham, England, Section of Institute of Metals.

SHERARDIZING*

AN ARTICLE DEALING WITH THE LATEST IMPROVEMENTS IN THE PRACTICE.

BY S. TROOD.

When employed more than three years ago as a Consulting Engineer by one of the large manufacturing companies, the problem of how to improve their sherardizing came to me.

A "free lance" Consulting Engineer as a rule cannot select the problem, and often must have a solution as quickly as possible, but in this case, sherardizing was a stumbling block.

It is a well known fact, that there are two general ways of solving manufacturing problems. The one and easiest way is gradual development; the other, which very often leads to a considerable broadening of the problem, is research work.

The concern which came to trouble with their sherardizing had been trying for nearly five years to place the process upon a manufacturing basis, and after the problem had been assigned to me, there was nothing to do, but to start a thorough research.

As a manufacturing engineer, I do not believe in mysteries, for when success is expected, the shop must be properly directed and instructed, and in looking into the details of sherardizing I found mysteries in every step of the process.

Today the shop did good work, and tomorrow, with practically the same methods, the work would not be acceptable. In the same sherardizing drum, one side would sherardize sufficiently, when the other side of the drum would not start to sherardize at all.

Manufacturing processes where such happenings occur are, in my opinion, out of the question. As simple as the process is, it was unexplained and undefined. This is why a thorough research was the first step I had to undertake to establish a satisfactory sherardizing method, which could be done alike today, tomorrow or any other day with the same results.

In looking over the literature, I found practically nothing so far as the scientific side of depositing zinc was concerned. I found a few descriptions by some people on how they tried to sherardize by depositing zinc by a dry process. Some authors would call it condensation and were trying to explain that; some of them would call it a process of diffusing metals, one into the other, with very poor explanations, and even the inventor himself called the process a mystery.

A process practically identical to this was known in prehistoric times, although used for another purpose. At that time, it was known that if certain copper tools and vessels were placed in the ground in certain localities and kept hot for a time by building fires over the place, then, upon removal it was seen, that the copper had assumed a light yellow color, and had become harder and more durable. That practically produced cementizing, although it was not known that another metal was alloyed with the copper. Also, in Greek history "by Aristotles," the bleaching of copper was done by a similar method. This was described as a religious ceremony where certain offerings and prayers were necessary to produce the wanted results. It was not known, however, that another metal entered into the alloy with copper.

Before going into the description of sherardizing, it is well to mention something about zinc. Zinc is a peculiar metal of pronounced characteristics. It is relatively low in malleability, ductility, tenacity and fusibility when compared with other common metals. Zinc has a melting point of 419 deg. C. and under atmospheric pressure a boiling point of 918 deg. C. While under vacuum, the boiling point is reduced to 548 deg. C. On the basis of silver at 100, zinc has an electrical conductivity of 29 and a heat conductivity of 36, and is practically non-corrosive in the atmosphere, a thin protecting coating of carbonate of zinc forming upon it. Zinc is one of the highest electropositive metals, having a potential of plus 0.493 volts.

Although many of the common metals date their discovery to prehistoric times, yet zinc was unknown as a metal until discovered by Paracelus in 1520. Previous to this, however, the action of zinc ores upon copper under action of heat was well known. Henchel in 1271, published an account of his discovery that metals when heated in calamine changed their properties, and in 1740, John Champion of Bristol, England, obtained a patent for the process.

Two of the processes of smelting zinc today date back to 1805 for the Belgian process and 1897 for the Silician process. In this country, the government was the first to use zinc, making the standard of weight and measure from brass.

It has only been within the last century, that zinc has been used commercially as a protection against corrosion, and as a proof that the tendency of using zinc is toward the conservation of natural resources, it will be seen, that by comparing the production of zinc and steel in this country for the last four decades, the large increase in each has been running parallel for the corresponding years.

In general, the process of sherardizing consists in treating in zinc dust, articles which it is desired to rust-proof. The zinc dust consists mainly of finely powdered metallic zinc with zinc oxide. After packing in a suitable container, the whole is heated for a certain period of time, cooled and articles then removed from the zinc dust.

From every day practice, we note that if we desire uniform results in a manufacturing proposition, we have to have uniformly arranged details. So far as the sherardizing is concerned, the uniformity of each step in the process is very vital and necessary for success.

In trying to explain what happens in the drum, the necessity of uniformity will explain itself.

Zinc dust is in a very finely divided state, and each particle covered with zinc oxide. In this condition, zinc could be heated above the melting point without fear of liquifying the mass. Because the zinc oxide is quite high fire-resisting material of inert nature, it prevents small particles of heated zinc uniting together and creating a solid liquid mass.

It is also a well established fact, that under these conditions, solid matter can be made to sublime. (In other words, a solid can be brought to a vapor, overstepping the liquid form.)

According to authorities, vapor tension for a small particle is greater than vapor tension for a big body, due to the difference in the ratio between surface and volume.

Armstrong, Thompson and other scientists have shown that a gas emanated from a solid has an electrical charge. From this, it follows that the microscopically small atmospheres of zinc vapor surrounding these dust particles are charged electrically, and due to their minute size, they may be considered to have all the properties of ions.

Iron being heated, also emanates gases which produce

*A paper presented at the Annual Meeting of the American Institute of Metals, September 28 to October 1, 1915, at Atlantic City, N. J.

ionic charges. Iron and zinc have different electrical potentials and therefore the ionic charges of zinc and iron vapors will have a different potential. If this is a fact, then discharges must occur. Ionic discharges precipitate solids from gases and in our case, zinc and traces of iron would be precipitated.

Assuming once more that the theory is correct, the atmospheric pressure will have considerable effect on the process, as the vapor tension of gases will vary with the pressure and the gases will be more readily emanated in vacuum. If we make use of a considerable vacuum, for instance 28" of mercury, the ionic discharge would be very effective. To prove this, I created a vacuum in a small sherardizing drum. In this case, the precipitation of zinc and iron took place at a much lower temperature and in considerable shorter time. Results were produced in ten minutes in a vacuum, which would require six hours at the same temperature but under atmospheric pressure.

It is a well known fact that the electric potential is higher for pure gas than for a mixture of gases. Therefore it is quite advantageous to have pure zinc dust and the iron in as pure a state as possible.

As before stated, zinc is one of the metals which has the lowest difference in temperature between melting and boiling point and this difference is quite low under vacuum. This is another proof that, with pure zinc dust under vacuum, the vapors will be created much more readily, ionically charged and precipitate the solids upon the surface.

From the above, we can draw the conclusion that uniformity of zinc dust is a very important factor. Uniformity of heat, however, is of just the same importance since the higher the temperature, the greater is the emanation of gases and therefore precipitation of solids. This may be seen on sherardized metal, in the typical "color lines."

With every increase of temperature, with all conditions the same, the precipitation of solids increases and creates a deposit of a different character and the same is true with a decrease in temperature, which retards the process and creates a less dense coating. These differences, which produce the stratified appearance or lines of color, are quite distinct under a microscope and may explain the very fine microscopic checks.

That the quality of iron to be sherardized has a similar effect on the process can also be readily understood, as emanation of gases from iron depends greatly upon its composition. Particles imbedded or stuck on the surface may also change the potential.

The last great factor in the process is time. It is self-evident that the effect of precipitation will continue so long as the conditions are favorable to create the effect.

To repeat:

1st. Composition and quality of the surface of the iron;

2nd. Composition and uniformity of zinc dust;

3rd. Proper uniform temperature;

4th. Time; are the most essential factors in the process of sherardizing.

The practical side of sherardizing depends solely upon the four factors just mentioned.

Sherardizing is mostly applied to steel and iron in all its forms. Articles which could not be heated, should not be sherardized. All material should be examined and rejected if it is scaly, covered with silica or any other impurities.

The best method of removing the impurities, in other words, preparing the surfaces to be sherardized, is shot air blasting. This method is fundamentally the best, because, in sandblasting particles of sand or silica penetrate the pores of the iron and are very disadvantageous. Pickling requires great skill and must be done very carefully, as very often sulphates or phosphates are created on the surface and if being washed in alkalies very often go into colloidal state. In other words, they become insoluble and very hard to remove. Another disadvantage of pickling is that the traces of salts, alkalies or acids when heated, may produce a retarding result so far as the ionic charges are concerned.

There are different zinc dusts on the market and those coming within the following limits would be the most advantageous:

Zinc between 85% and 90%.

Zinc Oxide between 8% and 10%.

Lead between 1% and 1.5%.

Other impurities between .5% and 1%.

The three most important elements to be kept near the above percentages are:

Zinc, which ought not to be below 85%.

Zinc Oxide, which ought not to be below 8%.

Lead, which ought to be kept down to about 1.25%.

Although good sherardizing may be obtained if some variations from the above exist, the best results will be obtained if the percentages are kept within the above mentioned limits. Lead must be kept down to the least practical amount, as experiments have shown that, when its percentage runs too high, lumpy deposits will appear on the sherardized plain surface and will also clog threads.

Free iron must be separated from the zinc dust as much as practice will allow, and in a well established plant this is being done at least once in four weeks. This will remove surplus small particles of iron, which are liable to become lodged between the jaws of cotter pins, etc., and thus cause trouble in assembly. By cleaning the dust this way, the mechanical incorporation of small percentages of iron dust in the coating is also prevented. The weekly analysis of the working dust should show the iron content.

It was mentioned above that the size of particle has an effect on a vapor tension. Therefore, zinc dust must be kept uniform in size. When the zinc becomes caked or lumpy, it should be run through a tumbling barrel and sifted through at least 80 mesh screen. To keep practically the same metallic content, it is necessary to add to every charge, between 8% to 10% of virgin zinc dust. Weekly analysis of zinc dust should be made and the samples taken from the working zinc dust which had been sifted and well mixed together in one or several sherardizing drums.

In the question of temperature, it should be understood that there is practically no limitation. If a very long time for the process is allowed, low temperature could be used, but this is not practical and therefore a higher temperature will have to be reached. Also, the drums or containers are of metal and the working temperature must be of such a degree as not to destroy the working of the apparatus. In one case, the temperature would be quite high and in another case it would be quite low.

Any practical apparatus which would keep a uniform temperature throughout, would be advantageous and in this respect, the electrically heated drum would be the more suitable, as here the control of the heat as to uniformity, time and degree is ideal and when electrical apparatus is used, 350 to 375°C would be the most suitable temperature, as within this range a very practical and serviceable apparatus can be designed. There are some successful installations where gas as a means of heat is employed and here the drums are passing through a continuous tunnel oven going gradually from the cold to the hottest zone and then to the cold.

The size of the container and construction have very much to do with uniformity of heat, as, if the dimensions are large, longer time is required to heat the apparatus.

Zinc dust is a very poor conductor of heat and articles hardly touching each other do not offer a good path for heat.

Continuous rotation of the drums eliminates to a certain extent those advantages, since it produces a uniform mixing of the contents of the drum and allows the more heated particles on the outside to convect the heat to the center. Packing the drum too tight will prevent a free flow of dust and heat and consequently different temperature zones will occur with resulting different degrees of deposit.

After deposit of zinc begins, with all other factors well established, the thickness of the deposit depends solely upon the time. All other factors being constant, a good coating depends upon time and if the process is continued too long, a brittle and easily chipped coating will result. This is due to the wide difference in coefficient of expansion and contraction between the zinc and iron, which have coefficients of .00002532 and .00001166 per degree centigrade, respectively.

The coating which is being deposited when the temperature is going up is the most dense and durable; next in quality will be the coating of the uniform temperature period and the least when the temperature is going down.

If small articles are treated where sharp profiles and threads are present, the time element is the most vital. It is very hard to establish any certainty in the time element but in every case it has to be established in accordance with other factors.

The relation of these vital factors to the process of sherardizing, is such that each one is dependent on the other, with the result that the variation of the one will require a variation of the others. Therefore, in order to simplify the process and make it practical on a manufacturing basis, it is found that uniformity is the essential element.

This is practically all that need be said on sherardizing, but much could be written on sherardizing for special conditions.

I have come in contact with practically every large sherardizing plant in this country and with very few exceptions, they still have some trouble with the process. After analyzing the troubles of these plants, I found that the uniformity and relation of these factors was not properly maintained.

I know at least one concern which—by using shot air blasting; very uniform and high metallic content zinc dust, which is periodically cleaned and magnetically separated and sifted; which use electrically heated drums of proper design, giving a controllable uniform temperature—obtain very desirable results on sherardizing. The purpose of this paper, however, is not to describe the every-day methods of sherardizing, but to point out the essential elements of the process.

The next step in sherardizing will be a continuous method in vacuum, for by this method, the narrow margins of the atmospheric pressure process will be broadened and more uniform results with less effort will be obtained. Experiments are now being carried with this end in view.

PERCENTAGE VERSUS TIME METHOD OF APPLYING OVERHEAD CHARGES.

SOME FACTS AND FIGURES RELATING TO MANUFACTURING EXPENSE.

BY FRANK O. VANCE.

The percentage method of applying overhead charges is generally employed because of its simplicity and, perhaps, because no better method, in some cases, is known. It does, we will concede, take care of and distribute this expense to the last cent, but a cost rendered on this basis fails to show the decreased cost of productions which results from the increased production of the faster and more skillful employee, and it does increase the overhead charges against the more expensive men.

To illustrate the latter point we will take a case which came under my personal observation. A man at 30 cents per hour and a boy, an apprentice, at 10 cents per hour were at different times given the same class of work. It was not a very difficult task and the boy could do the job just as well as the man. You will say, probably, why not have the boy do this work at all times? In explanation I will say that it is not practical at all times to do this yet it should be and probably is the aim of every foreman to give out work to the person who can handle it to best advantage considered from an economic point as well as regards the finish.

The overhead charges of this department, we will assume to have been 100 per cent.; the material cost we will estimate at 30 cents each. Both the man and boy finished 100 completed articles in 10 hours, the costs resulting as follows:

	Boy.	Man.
Material cost each	.30	.30
Labor cost each	.01	.03
Overhead 100% cost each	.01	.03
Total cost each	.32	.36

You will notice that there is not only a difference in the labor charges but also in the overhead cost, in fact, the man is carrying 200 per cent. more overhead than the boy. This, theoretically and in actual practice, is incorrect. They were using the same kind of tools, occupying the same amount of space, requiring equal amounts of heat, light and power in fact each should bear the same proportion of manufacturing expense except, perhaps, supervision. Theoretically and actually the man, because of his skill should require less supervision than the boy, who, learning his trade, requires instruction from the foreman or someone to whom this task may be delegated.

Summary:

	Boy.	Man.	Difference.
Material cost each	.30	.30	.00
Labor cost each..	.01	.03	.02
Overhead 100% cost each	.01	.03	.02
Total cost each...	.32	.36	.04

The time method of applying overhead charges distributes it just as thoroughly as does the percentage method and it enables the cost department to show the decreased cost of production resulting from the employment of the more skillful man. The overhead charges, which we have assumed to be 100 per cent., first stated in terms of dollars and cents. If the direct labor of dollars and cents for a given period were $600 the overhead charges must have been an equal amount. We will assume that there were 50 men employed in this department who were producing work, the wages of non-productive help, foreman, truckers etc., being included in the overhead charges. The department running 10 hours per day, six days per week.

Total number of productive men employed	50
Total number of productive labor hours	3,000
Average rate per hour	.20
Total cost of productive labor per week	$600.00
Overhead charge per week	$600.00

In actual practice the total number of productive labor hours would be less than stated for some of the men would lose time. From the above we see that the overhead charges are 20 cents per hour or 3⅓ mills per minute. Applying our overhead charges on this basis we have as our cost the following:

	Boy.	Man.	Difference
Material cost each	.30	.30	..
Labor cost each	.01	.03	.02
Overhead (time method, 6 minutes)	.018	.018	..
	.328	.348	.02

The difference being only in the cost of the labor; the material cost in each case, of course, being the same and the overhead cost should be, if the time to make were the same, equal in each case.

Where work is paid for by the piece the error of the percentage method is more apparent. The statement in our nation's most famous document that "all men are born free and equal" may be true, but all employers will agree that there is a difference in their degree of ability by the time they have attained manhood, and it is not unusual for an exceptionally fast man to produce from 50 to 100 per cent. more than the average of his associates.

To show how the percentage method fails to show the reduced cost by increased production we will assume the material charge to be as in the first instance, 30 cents, and the overhead charges to be 100 per cent. Brown producing 10 finished articles in 10 hours and Jones 12.

Brown.		*Jones.*	
Material cost of 10..	$3.00	Material cost of 12..	$3.60
Labor cost of 10...	3.00	Labor cost of 12...	3.60
Overhead 100% cost of 10	3.00	Overhead 100% cost of 12	3.60
Total cost of 10..	$9.00	Total cost of 12..	$10.80
Total cost of one..	$0.90	Total cost of one..	$0.90

A cost rendered with the overhead charges applied on a percentage basis would show a cost of 90 cents each in each case and yet the faster man has produced two more finished articles than Brown. There would be a slight increase in the overhead charge against the faster man but it amounts to so little at the most, not more than 10 per cent., that it is not taken into consideration, in fact, if it were on this basis, it would increase the cost. Apparently the only one benefited is the workman, who has increased his earnings, and his employers from the records of the cost department are not benefited in the least.

A cost rendered with the overhead charges applied on a time basis would show as follows:

Brown.		*Jones.*	
Material cost of one.	.30	Material cost of one.	.30
Labor cost of one..	.30	Labor cost of one..	.30
O. H. (time method, 1 hour)	.20	O. H. (time method, 50 min. ea.)	.17
Total cost of one..	$0.80	Total cost of one.	$0.77

Showing what has actually been accomplished. Jones has, by increasing his output, increased his earnings and his employers have saved three cents on each article in reduced overhead charges.

The advantages of the time method of applying overhead charges are that on the work that is paid for on a piece-work basis, it makes the difference in cost the difference in the overhead charges only; and for work paid for by the day, the time to perform the task being the same in each case, the difference is only the difference in the labor cost. As there must have been some reason for paying one man more than another, it is probable that the increased production of the higher paid man will by reducing the time spent on the job, reduce the overhead charges sufficiently to offset the increased cost due to the higher wage paid him.

It also eliminates that absurd condition which results where the overhead charges are applied on a percentage basis by increasing the man's wages automatically increasing the overhead charge against him at the same time which must result in showing in his products not only an increase in the labor cost but an increase in the overhead charge. To illustrate, a man receives $3.00 per day, the overhead charges at 100 per cent. against would be $3.00 if he produced 10 articles in a day of 10 hours, the combined labor and overhead charge would be for each 60 cents we increase his wages to $3.50 per day and immediately the overhead, for no apparent reason, increased also and a cost rendered on such a basis would be not 65 cents but 70 cents. It is true that when the overhead charges are next adjusted, the relative difference in the direct labor cost and the overhead would be greater and it would show for the entire room, a slight reduction in overhead, but as it would be spread over the entire department it would make no material reduction in the percentage of charges to be applied to each individual workman.

BUREAU OF STANDARDS STUDIES SPECIMENS OF BRONZE.

The quality of metal castings is usually determined by measuring the properties of a test specimen cast from the same metal. The United States Bureau of Standards has completed an investigation of the various foundry operations that influence the properties of the test specimen, for one of the most generally used commercial alloys, known as Government bronze, having the composition 88 copper, 10 tin, and 2 zinc. The bureau studied the effects of temperature on casting, methods of gating, casting, molding, kind of sand, heat treatment, and the effect of similar factors upon the resulting mechanical properties.

A microscopic examination of the fractured test specimens showed that the most common source of weakness was the occurrence of oxides within the metal. Such oxides appear frequently as thin films throughout otherwise sound metal, producing a condition of brittleness and low ductility.

A report of this investigation was read at the Atlantic City, N. J., meeting of the American Institute of Metals and will be published as a Technologic Paper of the Bureau of Standards, and may be obtained by application to the Bureau, at Washington, D. C.

AMERICAN SUBSTITUTE FOR VIENNA LIME

The Commerce Reports states that a firm of importers in New York, which was receiving high-priced lime from Germany and Austria, has found in this country a lime which is a good substitute for the foreign product. It is used for abrasive purposes, principally as a cleaner before nickel plating, or in combination with other materials for buffing purposes on nickel-plated work.

DETERMINING WEIGHT OF DEPOSIT *

Some Valuable Suggestions for the Chemical Determination of Electrolytically Deposited Metal

By L. C. Wilson.

(Continued from July.)

SILVER.

On account of certain desirable properties and the beauty of the finish which it gives, silver finds extensive use in the plating industry, large amounts of it being consumed every year in the manufacture of tableware, some classes of hardware and so on. It may be interesting to note that this was the first metal to be plated on a large scale, its employment dating back a good many years, and still seems to be holding its own in the estimation of metal workers, since no other meal or alloy has as yet displaced it to any great extent.

In its physical properties silver exhibits a number of characteristics which are of much value; it is the whitest of all the ordinary metals and takes a fine polish, which is not affected by moisture or air free from sulphur compounds, which cause blackening, due to the formation of silver sulphide. In hardness and tenacity silver is midway between copper and gold, being surpassed by the former in both of these respects and is in turn superior to gold. In malleability and ductility it is inferior only to gold, while as a conductor of heat and electricity it heads all other metals. It is a heavy metal, having a specific gravity of about 10.51 and melts at 960.7°C.

Silver has the further distinction of forming more insoluble salts than any other metal and it is relatively stable to many reagents, although a few attack it more or less readily. Nitric acid is the best solvent and is the one ordinarily used; hydrochloric acid is almost without action, while sulphuric acid slowly dissolves it, more readily when hot. In passing, it may be noted that silver is sometimes used as a substitute for platinum in making chemical apparatus, especially crucibles for alkali fusions, so it will be well to bear in mind that phosphorus, or compounds yielding this, are very destructive in their action, as are chlorine, bromine and iodine, while soluble sulphides and many organic compounds containing sulphur blacken it quickly.

Silver is universally deposited from a cyanide bath and, although many attempts have been made and with some success to work out a less objectionable medium, it still continues to be used.

Unlike the metals thus far considered, silver is fairly expensive, therefore greater precautions are taken in operating a plating solution, especially to see that the parts do not receive a heavier deposit than is actually demanded by the customer or required by the conditions of service. There must be no leaving the parts in the bath until someone at last remembers them or feels like pulling them out.

In order to secure uniform and definite deposits various devices, which are on the principle of the balance, have been worked out and are often used. In a simple form, an unplated part is attached to the beam, which is then balanced, and a weight equivalent to the total deposit desired added, after which the current is turned on. When the part has been plated sufficiently the beam over-balances and in some types thereby breaks the circuit. Such schemes doubtless do what is required of them, but it is obvious that they do not give any information about the distribution of the metal, consequently chemical means must be employed to answer this and similar questions.

Silver, like most other metals, may be estimated in several different ways and among these the electrolytic is likely to appeal to the plater.

In determining the amount of silver in a plating bath, for example, the platinum cone or dish, referred to in previous articles of this series, are carefully cleaned, rinsed with alcohol, then dried and weighed. From 10 to 20 cubic centimeters of solution are withdrawn and run into the platinum dish, or a suitable beaker, and about five grams of potassium cyanide dissolved in a small amount of water added. Distilled water is then added to fill the dish nearly to the top, after which the apparatus is set up, the solution electrolyzed, the dish or cone being connected, as usual, to the cathode or negative side of the current. Two or three hours will be required for complete deposition of the silver, and at the end of that time a few drops of the solution may be removed and touched with a drop of ammonium sulphide or copper oxidizing solution. If no black coloration is produced it indicates that all silver is out of solution and the cone or dish should be removed, without breaking the current, well rinsed with water, then with alcohol, dried and weighed. Of course, the increase in weight represents the amount of silver present in the quantity of solution taken for analysis, from which data the results may be expressed as may be desired.

The main objection to this method is that it, like other electrolytic methods, is not accurate when any other metals are present, which can be deposited under the same conditions as silver. The one most likely to be present is copper, as in the case of a silver-copper strike, or by being mechanically introduced from such baths, and as its removal would be more troublesome than to employ a new method altogether it would hardly be worth while to attempt it.

THE THIOCYANATE PROCESS.

Perhaps the best method of estimating the silver in such a case is by the thiocyanate process. Small amounts of other metals do not interfere much with it: mercury, cobalt or nickel must not be present in very large quantities, but a considerable proportion of copper may be allowed.

To make up the thiocyanate solution, about 10 grams of potassium thiocyanate are weighed out and dissolved in one litre of distilled water; owing to the fact that this salt is hygroscopic and cannot be dried without decomposition, it is not possible to make up a solution of the exact calculated strength by weighing out the solid material. It is necessary to standardize it, therefore, against a solution of pure silver of known strength and if routine determinations are to be run frequently it will save time and be advisable to make up a litre or so of it. This may be done by weighing carefully 10.788 g. of C. P. silver, dissolving in pure nitric acid, boiling until nitrous fumes are all expelled, then cooling and diluting to exactly one litre with distilled water. If it is not desired to make up

*Descriptions and illustrations of the apparatus needed to carry out the analysis described in this article are contained in an article by the same author, published in May, August and December, 1914.

so much standard solution, 5.394 g. of silver may be dissolved in acid, as before, and the solution diluted to 500 c. c.; or an amount of the standard sufficient for one test only can be prepared just as needed by taking .2157 g. of silver and treating as above, except that it is diluted only to about 70 c. c., this quantity being titrated, as described later.

In carrying out the standardization, 20 c. c. of the silver solution are taken and about 50 c. c. distilled water added. A saturated solution of ferric alum (not common alum) is made up and enough nitric acid added to bleach out the brown color. One cubic centimeter of this is added to the silver solution and the thiocyanate run in from a burette in the usual way, stirring constantly, until a faint, permanent red or pink color is obtained. The reaction consists, of course, in the formation of white, insoluble silver thiocyanate, thus:

$$AgNO_3 + KCNS = KNO_3 + AgCNS$$

As long as silver is present the thiocyanate reacts with it, but when it is completely precipitated the iron alum and thiocyanate form a red compound, which is easily detected and marks the end of the titration.

Knowing that each cubic centimeter of the standard silver solution contains .0107 g. of metal and 20 c. c. were taken, a total of .214 g., the value of one cubic centimeter of the thiocyanate solution can be obtained by dividing this figure by the number of cubic centimeters of thiocyanate required. For example, suppose 20 c. c. silver solution, = .214 g. silver, were titrated and required 22.3 c. c. of the reagent. Then .214 ÷ 22.3 = .0091 g., which is the value of each cubic centimeter of thiocyanate in terms of metallic silver.

It may be remarked here that it is necessary to keep the silver solution in the dark, or in a dark bottle, as it is readily decomposed by the light.

The determination of the silver content of a plating bath is not quite so easy as the foregoing, however, owing to the presence of cyanides, and perhaps chlorides, which must be gotten rid of. This may be accomplished in two or three different ways, one of these being to precipitate the silver and whatever copper and other metals are present by electrolysis, as shown above, then when the action is complete, rinse the deposit, dissolve in 50% nitric acid, boiling to remove all fumes, finally diluting with distilled water and titrating the silver with thiocyanate. The objection to this procedure is the extra manipulation involved and the time required, although the former really amounts to little since it is not necessary, of course, to weigh the platinum dish or cone, as in the regular electrolytic determination, and when the electrolysis is once started it will take care of itself. If quick results are desired, however, about the best way to get them is by the thiocyanate method, preceding it by certain operations needed to put the solution in condition for the titration. The process was given in more or less detail in THE METAL INDUSTRY some time ago, but for the sake of completeness it may not be out of place to review it briefly here.

Ten or 15 c. c. of the solution under test are put in a flask and 10 c. c. concentrated sulphuric acid added, the whole being evaporated over a free flame or hot plate until heavy, white fumes are given off freely and all the sediment or residue is dissolved. Rotating the flask over a Bunsen burner, holding it by a pair of tongs or a strip of cloth around the neck, makes it possible to perform this part of the analysis in a comparatively few minutes. Care must be taken, however, not to inhale the cyanide fumes, which are given off after the addition of the acid, as they are extremely poisonous.

When the contents of the flask has been sufficiently heated, it should be allowed to cool, then dilute to 75-100 c. c. with distilled water and add one cubic centimeter of the ferric alum solution, after which the titration with thiocyanate solution should be carried out as before.

The calculation of the results should present no difficulties; knowing the amount of plating solution taken for test and the number of cubic centimeters of thiocyanate required, together with the value of this in terms of silver, it is simply a matter of multiplying these last two figures together and dividing this result by the amount of plating solution taken for test gives the grams of silver in one cubic centimeter of the bath, which may easily be expressed in any desired terms. If a troy assay gallon was taken in the first place each 0.1 gram of silver found is equivalent to one troy ounce of metal per gallon.

A hood or good draught is required when performing this analysis, as the fumes given off are annoying and dangerous, especially at the beginning when the cyanogen is liberated. The method is, however, quick and accurate when properly carried out.

THE FIRE ASSAY.

Another rather simple and easy way of determining the amount of silver in a solution is to evaporate a definite quantity of this to dryness and melt the residue with certain fluxes, for example, sodium carbonate, either alone or mixed with a small quantity of powdered charcoal or potassium cyanide, which will reduce the silver salts present to the metallic form as a button which can be obtained by crushing and dissolving the fused mass in water, to which may be added a little diluted hydrochloric acid. The button is then cleaned, dried and weighed. It may be noted that this method is liable to give rather low results; moreover if the metals are present they will, or may, come down with the silver and be reckoned as such. In this case, of course, the results would be high. The procedure is given only because it requires less apparatus than either of the foregoing methods and may often be found serviceable enough for the rough determination of the metallic contents of baths or residues and employing it on a large scale affords a means of working up various wastes and recovering their silver contents.

(To be continued.)

INCREASED COST OF AUTOMOBILE METALS.

The increase of cost of the following metals has been given by various manufacturers of automobiles as the reason for the probable increase in the price of automobiles for the next year:

The cost of aluminum has advanced $50 per car, consisting of approximately 300 pounds of castings, which have increased 12 cents per pound; 110 pounds of sheet aluminum, which has advanced 11 cents per pound, and aluminum molding, which has increased $1.50 per car. Brass and copper have advanced approximately 4 cents per pound. There are approximately 250 pounds of brass castings on each car, and these represent an increased cost of $10. The materials for radiators have advanced $2.50 to each radiator. Lamps have gone up $2 per set. Crankshaft and connecting rod bearings have advanced $2.50 per car. The advance on door handles alone represents 50 cents to each car.

EDITORIAL

OLD SERIES
Vol. 21. No. 12.

NEW YORK, DECEMBER, 1915.

NEW SERIES
Vol. 13. No. 12.

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS.
Published Monthly

Copyright 1915 by
THE METAL INDUSTRY PUBLISHING COMPANY (Incorporated)

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, $1.00 PER YEAR, POSTPAID TO ANY PART OF THE WORLD. :: SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order : Cash Should Be Registered

ADVERTISING RATES ON APPLICATION
FORMS CLOSE THE FIRST OF THE MONTH

PALMER H. LANGDON - - - - - - - - - Editor and Publisher
LOUIS J. KROM - - - - - - - - - - - Managing Editor
GEORGE W. COOPER - - - - - - - - - Advertising Manager
THOMAS A. TRUMBOUR - - - - - - - - Circulation Manager

ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK.
TELEPHONE NUMBER JOHN 689 CABLE ADDRESS, METALUSTRY

CONTENTS

	Page
Collapsible Aluminum Cup	489
Safeguarding Grinding Machines	492
Copper Cyanide Solutions	493
The Failure of Structural Brasses (Concluded)	495
Foundry Ventilation	498
Bronzing Processes Suitable for Brass and Copper (Concluded)	501
Sherardizing	502
Percentage Versus Time Method of Applying Overhead Charges	504
Determining Weight of Deposit (Continued)	506
Editorial:	
Scrap Metal Melting	508
Correspondence and Discussion:	
Metal Exports	509
Books:	
Metals and Munitions	509
Shop Problems	510
Patents	512
Equipment:	
The Meaker Galvanizing Barrel	514
Metallic Flexible Hose	514
Platinum Melting Torch	515
Hand Sand Blast Machine	516
Hydraulic Cartridge Case Heading Press	516
Panghorn Corporation Exhibit	517
Electric Air Heating Device	517
Associations and Societies	518
Personals	520
Trade News	520
Metal Market Review	528
Metal Prices	529

SCRAP METAL MELTING

The high prices now being obtained by producers of virgin metals has driven the ordinary consumer into the scrap metal market and while, of course, the prices for scrap metals have risen in sympathy yet there is still sufficient difference between the costs of the two materials to make the employment of scrap a somewhat attractive proposition. This rush to the scrap pile has resulted in just what one would naturally expect to see, that is, that people who have not before had to resort to the use of this class of material have found themselves in difficulties. When they came to re-melt the scrap they had so feverishly purchased they did not obtain as good results as they were accustomed to getting when they used new material. We are continually getting questions on this order: "Our metal seems to be dead and sluggish and to have no life. What can we do to freshen it up? Is it possible to use some medicine to give us good metal?"

The above question throws an interesting light on the matter and we always can, upon receipt of such questions, form a mind's picture of just what our inquirer has been through. There seems to be quite a common idea among metal melters of today that the so-called "medicines" or deoxidizers, as perhaps they should be termed, are cure-alls for every form of disease that may attack a metal. In the case of a foundry or casting shop foreman who is forced to use scrap in place of the new and clean material that he has been accustomed to use, the average idea seems to be that all that is necessary to do is to melt that scrap material down in a crucible and, regardless of the time it has taken to melt it or the time that it has been in the fire, add some reagent such as phosphorus, silicon, manganese, sulphur, iron, tin, nickel or any other compound that may have been recommended, give the metal a stir and out with the pot, skim and pour the metal into molds and then be very much astonished if the castings are rejected.

The fact of the matter is, of course, that scrap material must receive considerably more care and attention not only in the melting operations, but also in its preparation for the fire than does new material. While the use of the above-mentioned reagents is necessary they very frequently will do more damage than good if the metal for which they are used to treat has been abused before the time comes for their application.

The scrap must be carefully selected, the heavy pieces kept by themselves, while the lighter portions

which would be likely to get oxidized in the melting must be put into compact form either by hammering into cabbages or crucible shape by hand or by the use of a cabbaging machine. Then the condition of the scrap should receive careful attention, that is to say, whether it is excessively dirty or not and if the former is the case a certain amount of cleansing flux must be employed in the crucible to bring up to the top of the metal whatever dirt may be released when the metal is melted.

There is no doubt that the various compounds with which the metal melter is familiar with as deoxidizers do a great deal of good and are possibly necessary in a great many cases, yet they do not completely reduce all of the injurious oxides which may have been formed during the melting of the metal if such metal has not had proper care and attention during such melting. The proper procedure to follow when one is forced to use a large portion of scrap is to prevent as far as possible the formation of injurious oxides. This is done as follows: Make a bath in the crucible first, by melting a large button or chunk and, failing this, in the form of solid metal, a cabbage weighing forty or fifty pounds, made from thin sheet metal may be employed. After this first batch of metal has been melted, others of the same character or heavy pieces are fed into the bath, which in the meantime is kept covered by a layer of charcoal broken to the size of chestnuts. The pot is gradually filled up by feeding in the metal carefully and when sufficient has been melted it is cleaned with a flux made of ninety per cent. common salt and ten per cent. soda ash in the proportion of two pounds of this mixture to a pot holding 250 pounds of metal. This flux is applied at the end of the melting operation and the pot of metal is thoroughly stirred, after which any additional spelter that may be needed to make up for that lost in melting is added. Then whatever deoxidizer it has been decided to use is now put into the pot by pushing down beneath the surface of the charcoal and flux.

If the pot of metal under consideration is of brass ½ of one per cent. of manganese in the shape of 20 per cent. manganese copper may be added with good results. We would not advise the use of either phosphorus or silicon in a high brass mixture, but aluminum, sodium, calcium and magnesium can be used with good effect in metal made from practically all scrap material. For low brass, bronze and pure copper castings such reagents as phosphorus, boron, silicon, manganese, magnesium, calcium, nickel and zinc may be recommended according to the different specifications that the castings are required to fill.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY. COMMUNICATIONS FOR THIS DEPARTMENT MUST BE SIGNED NOT NECESSARILY FOR PUBLICATION, BUT FOR PURPOSES OF IDENTIFICATION.

METAL EXPORTS

Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C.

GENTLEMEN: In the Bulletin of September Trade Analysis issued November 10, 1915, we do not notice that the metal "lead" is included in the exports.

We would like to know whether these figures are included in the items "Brass and Manufactures," as, of course, we know lead as a component part of ammunition is and has been shipped abroad in large quantities. THE METAL INDUSTRY.

To the Editor of THE METAL INDUSTRY.

I have your inquiry of November 12 in regard to exports of lead. That article was not specifically shown in the October trade analysis by principal articles, although included in the total. The figures for each class of lead exported during September and the nine months ending with September, 1915, were as follows:

Classes.	September, 1915.		Nine Months Ending September 30, 1915.	
Lead pigs, etc:	Pounds.	Values.	Pounds.	Values.
From domestic ore..	4,916,247	$241,857	125,682,567	$5,442,494
From foreign ore...	7,446,648	326,595	24,350,585	973,633
All other lead mfrs.	.....	307,061	.....	1,333,671
Total values		$875,513		$7,749,798

In future analyses of the monthly export trade lead will be given a separate class, in view of its increasing importance in our foreign commerce.

Bureau of Foreign and Domestic Commerce,
Washington, D. C., November 13, 1915.

E. A. BRAND,
Assistant Chief of Bureau.

BOOKS

Brass, copper, zinc, aluminum, nickel and other non-ferrous metals being of such enormous importance in the production of munitions, it is not surprising to learn that the Institute of Metals (which takes within its purview these and all other metals except iron and steel) is very closely concerned with the production of the thousand and one metal articles required for the successful prosecution of the war. The Institute is in daily touch with many of the munition factories throughout the country, and also with certain Government departments requiring metallurgical information. As an indication of the utility of the publications of the Institute of Metals (particularly at the present time), it may be mentioned that large shipments of the Journal of the Institute of Metals, in which are recorded the very latest scientific methods of dealing with the non-ferrous metals, are being despatched to Japan and the United States for use in works engaged in producing munitions for the Allies. In addition, volumes are being sent to various public and university libraries located in the United States munitions centers. German submarines have taken toll of large consignments which were sunk in the Hesperian and the Arabic, but duplicate sets of volumes have now replaced those lost in this manner. The volumes are supplied gratuitously to members—numbered among whom are most of our important munitions makers—but copies can be purchased by non-members from the offices of the Institute of Metals, Caxton House, Westminster, England.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating

ALLOYING

Q.—We would like to know what per cent. of tin the usual run of tin foil contains. Also what per cent. of lead in the usual scrap lead. We would like to know how we could analyze solders and babbitts, containing tin, lead, copper, antimony and bismuth, for their purity.

A.—The usual run of tin foil contains less than 10 per cent. of tin and it may run as low as 3 per cent. tin. Scrap lead may be soft or hard. The former is usually pure and the latter contains antimony. When miscellaneous scrap that is suited for solder making is remelted, it is usually done in a reverberatory furnace and the impure solder liquated at a low heat in a sweating furnace. A great many solder makers have found that the use of Richard's Scale is a very satisfactory means of testing the quality of their product. The solder is cast into cones in molds like bullet molds. These cones are placed on a scale which shows directly the percentage of tin and lead. The reverse side of the scale is graduated for showing the percentage of lead and antimony in mixtures that contain as high as 24 per cent. of antimony. Babbitt metals that contain other metals than lead and antimony, for instance copper, tin, etc., must be analyzed by a competent chemist using recognized standard methods. A quick and reliable test for uniformity however is found in the Brinell Hardness Tester. Analytical methods for testing the metals, tin, lead, antimony, copper and bismuth for purity may be found in the standard text books.—J. L. J. Problem 2,223.

ANNEALING

Q.—What are the most suitable temperatures for annealing nickel silver containing the following mixtures:

Copper	60	Copper	60
Nickel	20	Nickel	10
Zinc	20	Zinc	30

A.—Nickel silver of the composition mentioned, if annealed for one hour at 900 degrees Centigrade ought to roll easily and satisfactorily.—J. L. J. Problem 2,224.

BRASSING

Q.—How can we obtain a rich brass finish on tinned wires as noted on enclosed sample? The ordinary brass solution fails in depth of color. The price of finishing same is an important item.

A.—From the appearance of the article submitted to us as a sample we are of the opinion that the finish is produced in the following manner:

Cleanse the articles in the usual manner; then plate them in a hot cyanide copper bath for twenty to thirty minutes. Remove, wash in water and pass through a bright acid dip such as used for dipping sheet brass goods. This dip is composed of equal parts of oil or vitriol and aqua fortis, but it is better to use an old dip that has been previously used for some time, as a new dip may be too sharp.

After coppering and dipping as mentioned the articles should only be flashed in a warm brass solution to obtain the color desired, as would result if the articles had to be gilded in a gold bath. With a proper regulation of the current and a weak solution no difficulty should be experienced in producing results as per sample.

If frames are made so that at least a gross can be placed upon them the articles should be finished, including lacquering, for ten cents per gross.—C. H. P. Problem 2,225.

CASTING

Q.—We are making aluminum spoons in a die casting machine, but have considerable trouble with the valve in the pot due to the hot aluminum eating and destroying the valve and causing it to leak. Do you know of any metal that this valve could be made of, or of a process to treat the valve metal?

A.—A dense, close grained grade of cast iron will resist to quite a degree the corrosive action of molten aluminum, zinc and the commonly used die casting alloys. Such an iron may be had by adding small amounts of nickel, ferro-titanium or other high melting point alloys to the cast iron.

A very successful refiner of zinc dross claims that if 50 per cent. of old burned stove plate is added to 50 per cent. of good machinery pig iron, kettles will be obtained that hold a remarkable life when used for melting zinc dross or zinc. The iron oxide of the burned stove plate no doubt has refining action on the cast iron and gives castings of a very fine grain.

Surface oxidation of the valves by any of the well known methods may be tried and it is claimed by some that if a tough adherent coating of oxide is formed that it serves as a preventative of corrosion by zinc or die casting alloys, but in the case of aluminum the well known alumino-thermic reaction would probably destroy any oxide film immediately. —J. L. J. Problem 2,226.

CHEMICAL

Q.—We should esteem it a favor if you would let us know what silver Trisalyt is, as mentioned in your October issue.

A.—Silver Trisalyt is, as its name implies, three salts. It consists of a chemical combination of sodium cyanide, silver cyanide and sodium sulphite and contains 30 per cent. of metallic silver.—C. H. P. Problem 2,227.

FINISHING

Q.—We should appreciate it if you will give us some information relating to the best method of obtaining a straw finish on steel buttons.

A.—The following process should be pursued to produce a highly burnished straw color upon steel buttons:

First—Tumble with fine Arizona grit and a little sal soda, mixed with water to remove rough edges. Second—Tumble with steel balls, using one of the regular soap lubricants or borax water with a small proportion of soap chips dissolved therein. Third—Dry out by the aid of boiling water and sawdust. Fourth—Re-tumble, using only the steel balls as a burnishing agent. Fifth—Color in a revolving drum over bunsen gas flames until the straw or bronze color is produced.—C. H. P. Problem 2,228.

MECHANICAL

Q.—As we use a large amount of Briggs standard pipe taps in sizes from ⅛ inch to 2 inches inclusive for tapping out brass fittings and grind them in the flutes when we sharpen them. By so doing they lose their size in diameter and strike the shoulder in fitting and we then have to have them ground on the end. Can you advise us how to improve on this?

A.—Taper taps for iron pipes must be relieved both on the top and in the angle of the thread. The size of pipe taps

is usually measured by a ring gauge. The limits of accuracy are ordinarily determined by the amount that the end of the tap projects through or comes short of the face of the ring gauge at the small end of the whole, the ring gauge being made so that the end of the correct tap comes flush with the face of the gauge. The limits of accuracy usually required are such that for sizes from ⅛ inch to 1 inch the end of the tap should not project through or come short of the face of the ring gauge 1/32 of an inch. For pipe sizes from 1¼ to 3 inches inclusive this dimension may be 1/16 of an inch and for pipe sizes 3½ inches and larger ⅛ of an inch.—P. W. B. Problem 2,229.

MIXING

Q.—Will you kindly inform us what is the analysis of No. 26 bronze bearing metal? We have had a call to supply this and are not familiar with the composition.

A.—The composition of No. 26 bronze bearing metal is as follows:

Copper	80	per cent.
Tin	10	" "
Lead	10	" "
Phosphor	.05 to 25	" "

Problem 2,230. —J. L. J.

Q.—Can you furnish us the formula for Benedict nickel and state what relation it has to German silver?

A.—Benedict nickel or metal, as it is also called, consists of eighty parts of copper and twenty parts of nickel and does not really bear any relation to German silver, except in its color and wearing and working qualities.

Judging from the amount of nickel in Benedict nickel, it might be likened to a 20 per cent. German silver, but on the other hand this latter mixture would not contain more than 65 per cent. of copper, 20 per cent. of nickel and 15 per cent. of zinc. So we might say that the difference between Benedict nickel and German silver is that it contains copper and no zinc.—K. Problem 2,231.

MOLDING

Q.—Can you give a suitable mixture for pattern metal to make plates for patterns for steam fittings, etc., and is there any special limit in the molding of such plates which would be of help?

A.—The alloy of aluminum 75 and zinc 25 is well aadpted for making plates or patterns for steam fittings where few changes have to be made in them subsequently. Where patterns have to be altered and soldered the aluminum alloy is not so good, and a better mixture is zinc 50 and tin 50, as it can readily be soldered. This mixture, if poured at the proper heat, does not shrink much and will be found very satisfactory. In molding the plates strips should be used to limit the thickness of the plates to a quarter inch.—W. J. R. Problem 2,232.

Q.—I am using a gold solution which is used cold for plating inside of spoons only. It consists of the following:

Yellow prussiate of potash	0.5	ounce
Sodium carbonate	0.5	ounce
Chloride of gold	30.75	grains
Water	1	quart

It is used for a cheap bright plate and the results are very bad. I can only get one good one out of eight or nine articles. Some come spotted, some cloudy and others do not plate at all and again some plate more on the green gold. Use a voltage of 3 volts. Can you tell me what the trouble is?

A.—The formula you are using is of little value for your purpose unless used as a hot solution, and then it will be necessary to add a small amount of cyanide of potassium to give the solution the proper action. With the addition of cyanide the solution may run cold, but your gold content is very low for a cold solution. It should contain twice as much.

For a good working solution for your purpose use the following formula: Dissolve cyanide of potassium in warm water so that it stands 2 degs. Baumé; then dissolve 60 grains of chloride of gold in water and precipitate with ammonia water, forming a brown precipitate of a fulminate of gold. When all the gold is thrown down let it settle; then drain off the clear solution. Wash the precipitate two or three times and add to the cyanide solution. If you use a warm solution half as much cyanide and gold given above can be used per quarter, but for a cold solution not less than 60 grains should be used. A little phosphate of soda will give a good bright yellow color to any gold solution, provided there is sufficient gold in solution and the corresponding amount of cyanide.—C. H. P. Problem 2,233.

SOLDERING

Q.—I would like to know of a good and cheap solder for mending aluminum castings by the use of an oxy-acetylene burner. I should also like a mixture to be used where a piece has been broken off of the casting.

A.—Aluminum castings as a rule are rather brittle and if already cracked it is necessary to pre-heat them and support them properly while welding in order to avoid future injury to the castings and the danger of cracking after mending because of the introduction of internal strains. The oxy-acetylene flame should be reducing and when the surfaces to be mended soften they should be scraped with an iron wire carrying a hook on the end. As a welding rod, sticks of suitable size of alloy No. 12 may be used (aluminum 92, copper 8) to which a little manganese copper (about 0.25 per cent.) has been added.—J. L. J. Problem 2,234.

RETINNING

Q.—Kindly advise us of the best method of re-tinning copper and steel.

A.—In re-tinning brass or copper and iron or steel the following methods should be followed:

First—The surfaces of the metal to be tinned should be cleansed from grease or rust by any of the usual methods.

Second—Immerse in a chloride of zinc flux made up by dissolving zinc metal scrap in muriatic acid to saturation and then adding about one pound of sal ammoniac per gallon of flux.

Third—Immersing in molten tin, which should be heated in an iron kettle and covered to the depth of one inch with mutton tallow or cocoanut oil. The oil or tallow acts as a flux, prevents the oxidization of the tin and produces a brighter color.

Fourth—The articles should then be immersed, after tinning, in paraffin or kerosene oil and then rubbing in sawdust.

In some instances two tinning baths are used; the first should be a number of degrees cooler than the second or finishing bath.—C. H. P. Problem 2,235.

TINNING

Q.—I shall be obliged if you will tell me through your columns how I can tin the face of cast iron steps. I have tried giving them a coat of spirit of salts and heating the steps over a coke fire, then using Tandem plastic metal with powdered sal ammoniac as a flux, but after cooling down I can peel the deposit off, the tin having no affinity for the cast iron.

A.—To tin the face of cast iron steps without immersing in the tin bath the following manipulations must be followed:

First—Cleanse the surface of the iron thoroughly with alkali, such as caustic soda, etc. Wash with clean water and then go over with a 10 per cent. solution of muriatic acid. Then apply a flux consisting of a concentrated solution of chloride of zinc made by dissolving zinc scraps in muriatic acid to saturation, then add about 1 to 2 pounds of sal ammoniac to each gallon of flux.

Second—Coat the surface of the iron steps to the melting point of the tin, about 500 degrees. Re-coat with the flux, mix up a little sal ammoniac with the powdered or granulated tin and rub over evenly with tow or hemp. Repeat the operation with the tin and sal ammoniac by re-heating somewhat and finally rub down while still hot with mutton tallow or cocoanut oil to even up the tin coating.

We believe the above information regarding manipulations will give excellent results.—C. H. P. Problem 2,236.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY

1,157,283. October 19, 1915. **Black Finish.** M. A. Atuesta, Schenectady, N. Y. Assignor to the General Electric Company of New York.

The patent covers:

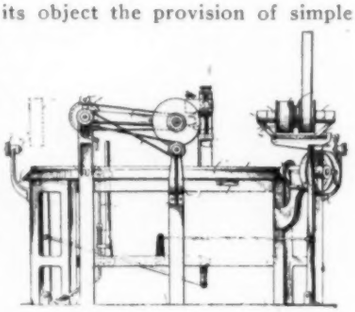
1. The method of producing a rust-proof black finish on ferrous articles which consists in coating them with zinc, heating them in charred bone dust mixed with carbonaceous binder, and subsequently quenching them in carbonaceous liquid.

2. The method of producing a rust-proof black finish on ferrous articles which consists in coating them with zinc, heating them in finely divided phosphorus-containing carbonaceous material mixed with black carbonaceous binder, and subsequently quenching them in oil.

3. The method of producing a rust-resisting black finish on ferrous articles which consists in heating them in charred bone-dust mixed with carbonaceous binder and subsequently quenching them in carbonaceous liquid.

1,158,136. October 26, 1915. October 26, 1915. **Grinding, Polishing or Buffing Machine.** Carl B. Lorson, Irvington, N. J.

This invention has for its object the provision of simple and effective means by which metal pieces may be ground, polished or buffed or otherwise worked.



A further object of the invention is to provide a device, as shown in cut, by which a large quantity of small articles may be ground, polished or the like with the minimum expenditure of labor, and at a high rate of production.

Another object of the invention is to provide a means by which work may be readily placed in and taken out of the fixtures for holding it without thereby decreasing the production of finished work.

A further object of the invention is to provide means by which a grinding wheel or the like may be made to conform to the surface being ground so as to produce undue depth of cut on some portions thereof, and also to provide means by which a piece of metal may be ground or otherwise worked regardless of its shape.

1,158,671. November 2, 1915. **Hard Lead Alloys.** Francis C. Frary, of Minneapolis, and Sterling N. Temple, of St. Paul, Minn.; said Temple assignor of one-sixth of the whole right to said Frary.

This invention has for its object to provide an improved metallic alloy having certain characteristics especially adapting it for use in the casting of type and similar articles in molds, and in the manufacture of bullets and other forms of ammunition.

The inventors say:

"In carrying out our invention, we use a small quantity of metallic calcium in a main body of lead. We have also found that with a very small per cent., to wit, less than two per cent. of metallic calcium in lead, the alloy may be made as hard as where a much greater quantity of antimony is used. We have also found that the alloy containing a small amount of metallic calcium may be improved and made still harder by the use of a small amount of copper or a small amount of aluminum."

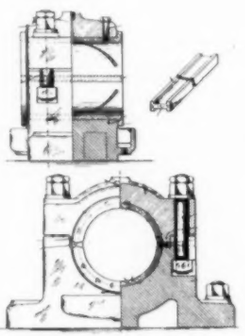
The patent covers the following claims:

As a new article of manufacture, a metallic alloy having a main body of lead and containing a small amount of metallic calcium.

As a new article of manufacture, a metallic alloy having a main body of lead and containing a small amount of metallic calcium, and also a small amount of copper.

As a new article of manufacture, a metallic alloy having a main body of lead and containing metallic calcium in an amount less than two per cent.

1,158,436. November 2, 1915. **Shaft or Roll Bearing.** David R. Bowen, of Ansonia, Conn., assignor to Farrel Foundry & Machine Company, of Ansonia, Conn., a corporation of Connecticut.

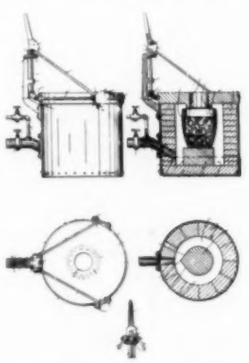


This invention relates to a shaft or roll bearing of the type which is furnished with a lining of special bearing metal, such as bronze, babbitt, brass, or the like.

Heretofore it has been a common practice to construct the lining of two or more sections interposed between the base or pillow block and the cap, and forming a complete circle. Considerable difficulty has been encountered in locking the lining sections in place in a satisfactory way so as to prevent them from turning with the journal, and in preventing one or more sections from buckling under the weight of the journal, particularly when the lining becomes more or less worn.

The object of this invention, therefore, is to provide simple and effective means, as shown in cut, for locking the lining sections against creeping or turning in their seat or seats, and it is aimed to provided a construction in which this locking means will absolutely prevent the locking sections from buckling or springing inward at their side edges so as to bind against the journal.

1,158,875. November 2, 1915. **Metal-Melting Furnace.** Ora J. Warman, of Cincinnati, Ohio, assignor, by mesne assignments, to the Buckeye Products Company, of Cincinnati, Ohio, a corporation of Ohio.



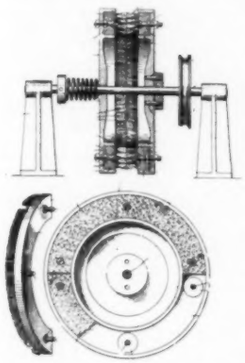
It is the object of the invention to provide a metal melting furnace of novel construction and so arranged as to receive a crucible in which the metal is arranged to be melted, the furnace being so constructed and arranged as to be fed by a fluid-fuel and preferably capable of having a pressure above atmospheric pressure maintained therein, and the invention will be readily understood from the following description and from the drawing:

The furnace is provided with a fuel-inlet, shown as a cavity formed in the fire-resisting side-wall of the furnace and sloping downwardly and inwardly so as to project the fluid-fuel emitted therefrom toward the nose and the bottom of the channel. This fuel-inlet is fed from a suitable source, shown as a pipe for the fluid, such as gas or oil, preferably gas, provided with a regulating valve, and as a pipe for air, preferably under pressure, a regulating valve being provided in said pipe. The fluid passing through the pipe is also preferably under pressure, and the fluid and air are arranged

to be mixed in the mixing chamber, the mixed fuel being projected through the opening of the jacket of the furnace into the fuel-inlet.

1,160,613. November 16, 1915. **Cleaning and Polishing Machine.** L. H. Illing, Chicago, Ill.

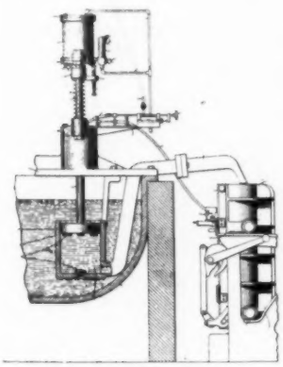
This invention relates to cleaning and polishing machines of that class adapted for cleaning and polishing knives, forks, spoons and the like, and has particular reference to the rotary brushes thereof which perform the cleaning and polishing operation. Brushes of this kind are usually of ring like formation, the bristles projecting laterally from the ring; two brushes are employed in each machine and they are set with the bristles of one brush opposing and contacting with those of the other brush. The brushes are revolved rapidly and the article to be cleaned and polished is inserted between them.



When sharp knives are operated on by the brushes, it frequently happens that the bristles are cut and often one or the other of the brushes is destroyed or damaged to the extent that a new brush must be substituted therefor. The brushes are somewhat expensive and the repairs are costly, due to frequent replacement of the brushes.

Th principal object of this invention is to minimize the cost of repairs by providing sectional brushes, as shown in cut, in the form of segments which may be removed from and replaced by new ones when worn out or damaged.

1,160,973. November 16, 1915. **Apparatus for Making Castings.** George M. Clark, Jr., of Nahant, Mass., assignor to R. Hoe & Co., of New York, N. Y., a corporation of New York.



This invention relates to apparatus for making castings and more particularly to apparatus for casting stereotype plates.

The object of the invention is to provide means in an apparatus of the character described, for producing castings of a greater degree of perfection and of a more uniform character.

It is also an object of the invention to increase the speed with which such castings are produced.

To the accomplishment of these objects and such others as may hereinafter appear, the invention comprises the features and combinations of parts hereinafter described and particularly pointed out in the claims.

It is to be understood that, while the invention is illustrated and described as embodied in an apparatus for making stereotype plates, it is equally applicable to apparatus for making any other form of casting from molten material.

The preferred embodiment of the invention is illustrated in the accompanying drawings.

1,160,430. November 16, 1915. **Process of Melting Aluminum or Aluminum Alloys.** Grenville Mellen, Mount Vernon, N. Y.

This invention relates to a new and useful process of melting aluminum and its alloys and has for its object to protect and preserve the metal from destruction by oxidation and to produce ingot and other forms of casting which shall be of a sounder nature to a degree than has been heretofore practically impossible to effect.

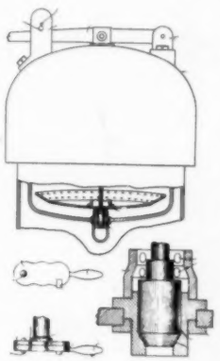
The inventor claims:

1. The process of melting aluminum or an aluminum alloy which consists in melting the aluminum or the aluminum alloy in the atmosphere of a gas substantially chemically inert toward the aluminum or the aluminum alloy, then creating a partial vacuum with the melting chamber while the aluminum or the aluminum alloy is yet molten.

2. The process of melting aluminum or an aluminum alloy which consists in creating a partial vacuum within the melting chamber, then admitting a gas which is substantially chemically inert toward the aluminum or the aluminum alloy into the melting chamber, and then melting the aluminum or the aluminum alloy in this atmosphere which is substantially chemically inert toward the aluminum or the aluminum alloy.

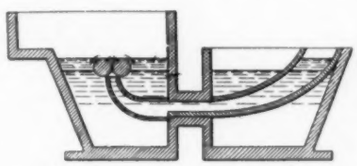
1,161,047. November 23, 1915. **Melting-Furnace.** Isaiah Hall, Aston, Birmingham, England.

This invention relates to melting furnaces, more especially such as are adapted for re-melting used metal, cleansing it, and casting it into ingots and has for its object to provide improvements relating to such furnaces with the object of facilitating their use.



Such a furnace is filled with metal and heated by gas or othewise from below. Some suitable arrangement must be made for allowing the metal to flow from the furnace to the molds or like when required, and for greater convenience the furnace is provided with a regulating valve, as shown in cut, located centrally and a reciprocating stirring device attached to a sleeve or the like surrounding the stem of the said valve. The upper suface of the metal pot is enclosed by a cover which may have sliding doors for the admission of metal for charging the pot and may have an arrangement of pipes and flues as described in the prior U. S. Patent No. 1,117,667, issued November 17, 1914.

1,161,475. November 23, 1915. **Process of Coating Iron and Steel Sheets with Lead and Lead Alloys.** Reginald Hazeltine, of Wheeling, W. Va., assignor to Wheeling Corrugating Company, of Wheeling, W. Va., a corporation of West Virginia.



This invention relates to the art or process of coating iron and steel sheets or plates with lead or with alloy mixtures wherein high percentages of lead are employed.

The invention contemplates the employment of rolls, as shown in cut, the outer surfaces of which are composed of a non-ferrous metal, as brass, bronze, nickel, copper, or monel metal, which, instead of repelling a tendency to become coated in the presence of palm oil, as do iron and steel rolls, readily take or acquire a coating of lead or of a high percentage lead alloy, said rolls being submerged or partially submerged in the palm oil of a pot containing the lead or alloy in liquid form. The sheets to be coated are passed through, or between, said non-ferrous rolls after having passed through the fluid coating metal in the pot, and, in so passing through, said rolls act to smooth the coating on, and impart an even finish to, the surfaces of the sheets, causing the latter to emerge free from dirt and scruff.

1,161,612. November 23, 1915. **Solder.** Joseph Cayacca, Sacramento, Cal.

This invention relates to solders and has for its object the provision of a solder especially designed for the soldering of aluminum metal without the use of an acid or flux which will be non-corrosive and have the appearance of the metal treated.

The component parts of the invention are tin, lead, and aluminum commingled in approximately twelve and four-fifths ounces of tin, three and one-fifth ounces of lead, and one ounce of aluminum.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

THE MEAKER GALVANIZING BARREL

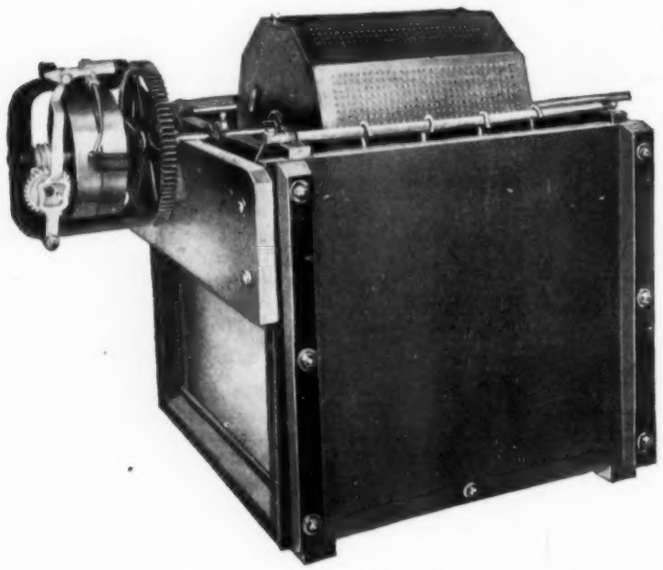
Within the past few years there have come into the channels of trade an ever increasing variety and volume of small steel parts, requiring a coating which will durably preserve them against corrosion.

The Meaker Barrel Galvanizing unit, manufactured by the Meaker Company, of Chicago, Ill., in which zinc is continuously applied while the barrel is intermittently rotated, it is claimed, gives the manufacturer of small steel parts just what he is looking for to make his goods durable and provide them with the required bright, marketable zink finish.

A description of the elements which combine to form the Meaker galvanizing barrel will be of interest to those who wish to deposit a reliable zinc finish on small steel parts in bulk.

The tank holding the galvanizing solution is built of clear tank grade cypress stock, thoroughly rodded. In addition, the tank is of generous size so that the solution will not become unduly heated, and deep enough to permit the settlement of sediment which invariably accumulates in the handling of large volume of small steel parts. This means a continuously clean solution, also unspotted finished galvanized product.

The barrel is of second growth hickory stock designed to withstand the hardest kind of operating service, each stave edge overlaps, in this way preventing the loss of thin, flat or exceedingly small pieces. Both staves and barrel heads are impregnated with a special compound which fills the pores



MEAKER INTERMITTENT GALVANIZING BARREL.

and prevents the wood from becoming conductive. Staves of the material and design employed in Meaker barrel will not give under any strain due to weight of goods carried; warping, swelling or bulging is impossible. The thickness of the hickory stock employed depends upon the service the barrels will encounter and size of perforations also depends upon the product to be galvanized.

The shaft and contacts. Parallel with the barrel axis and running through the center of both heads is a heavy copper shaft, supported each end in suitable bearings set in edge of tank. This shaft at no point comes in contact with the galvanizing solution and, therefore, cannot become coated with zinc—no waste of metal or electrical energy results as is the case when shaft is submerged in the galvanizing liquid. Suspended from the copper shaft by means of contact rings are the copper contact arms, all thoroughly insulated, except at their extreme lower ends. These contact ends are continually buried in the product being galvanized, giving the goods excellent electrical connection at all times. From the copper shaft the negative lead is taken directly to the generator.

The galvanizing solution. One of the most important factors contributing to the success of the Meaker galvanizing barrel, it is said, is the rich galvanizing solution employed. This highly conductive liquid makes possible the use of stronger current and higher pressure than has ever been thought possible. The zinc is transmitted to the goods easily at maximum speed, coating all portions of the work in minimum time. The durability and luster of the galvanized finish is unsurpassed by any other barrel galvanizing process.

The anodes. Cast zinc anodes hanging from solid copper rods supply zinc in the required volume to the solution. These anodes are in shape and section such as have been found most efficient for barrel galvanizing. The anodes wear away evenly, making little scrap to be remelted. Positive electrical lead is taken from the copper rod supporting these anodes directly to the electric generator.

Operation. After the equipment is set up, the leads connected and the tank filled with galvanizing solution the barrel is loaded with pieces to be galvanized, which have been previously cleaned and pickled, free from grease, scale and rust, the barrel cover replaced and the belt lever thrown. This starts the barrel rotating and galvanizing immediately proceeds.

After short period of rotation during which time the goods are thoroughly agitated and have changed their relative position, the barrel automatically stops for a period of still galvanizing. This is accomplished through the operation of a small worm gear mechanism which alternately stops and starts the barrel for controlled periods of time. Therefore, after each interval of still galvanizing the barrel is automatically set in rotation for a given period. It should be understood that galvanizing continues constantly during both the intervals of still plating and motion plating, the goods being given their heaviest coating while the barrel remains still.

The intermittent system of barrel galvanizing is guaranteed to produce the maximum coating of zinc in the shortest time. Threaded pieces or those having clear-cut sharp edges do not wear away or are not injured when galvanized in Meaker barrel. Write for a copy of the booklet B1.

METALLIC FLEXIBLE HOSE

The manufacturing in this country of flexible metal hose (which is just what the name implies—a hose made of metal) dates back only a few years. Metal hose has been made on the

METALLIC FLEXIBLE HOSE.

continent and largely used for something like twenty years, but it was not until 1910 that it really became a recognized industry in the United States. Prior to that time more or less of the

flexible metal tubing used in connection with automobile horns, etc., had been produced here, but metal hose proper—that is, metal hose for the same line of duties for which rubber hose is employed—was practically unknown. It may seem strange that an article which was widely known and much used in Europe was practically unknown in this country, but this is perhaps accounted for by the fact that rubber hose has always been high priced over there, while cheap labor made it possible to manufacture metal hose at comparatively low prices.

In 1910 the American Brass Company completed arrangements for the manufacturing of metal hose, and a large factory in Waterbury, Conn., was equipped with the most modern machinery, the greater part of which was imported. The original plan was to have the business conducted by the Waterbury Brass Goods Corporation (a subsidiary of the American Brass Company), but this was later found to be impractical, and the American Metal Hose Company was organized to carry on the work. This concern is now in the eighth year of its existence, and its history has been one of steady growth and expansion.

There are certain easy services in which rubber hose gives a fairly good account of itself, but the intense heat generated by steam at high pressures and the chemical action of oils, acids, alkalis, etc., cause rubber hose to deteriorate rapidly and make it unsatisfactory and expensive. It has been by seeking out these duties to which rubber hose is not adapted, and manufacturing a product that performs them efficiently and economically, that the American Metal Hose Company has made its success. They make more or less flexible metal tubing for use in automobiles, motor boats, etc., but the principal part of their business is in hose for the same classes of work for which rubber hose is used. Flexible tubing for automobiles is made in a number of styles and is used as a covering for electric wires and speedometer shafts; for conveying warm air from the manifold to the carbureter; for exhaust tubing; for gasoline feed lines; for grease tubes, and many other special connections.

Pressure hose, or metal hose proper, is made from a continuous strip of tough phosphor bronze (commonly but incorrectly called copper) or galvanized steel coiled spirally over itself. The edges of the strip are turned in during the coiling operation in such a way as to form the "interlocking" construction shown in the accompanying illustration. At the same time an asbestos cord packing is fed into the groove designed to contain it in the metal strip, and makes the hose pressure-tight. The "American" interlocking construction, which is an improvement over the hose formerly made in Europe, gives maximum strength and flexibility.

PLATINUM MELTING TORCH

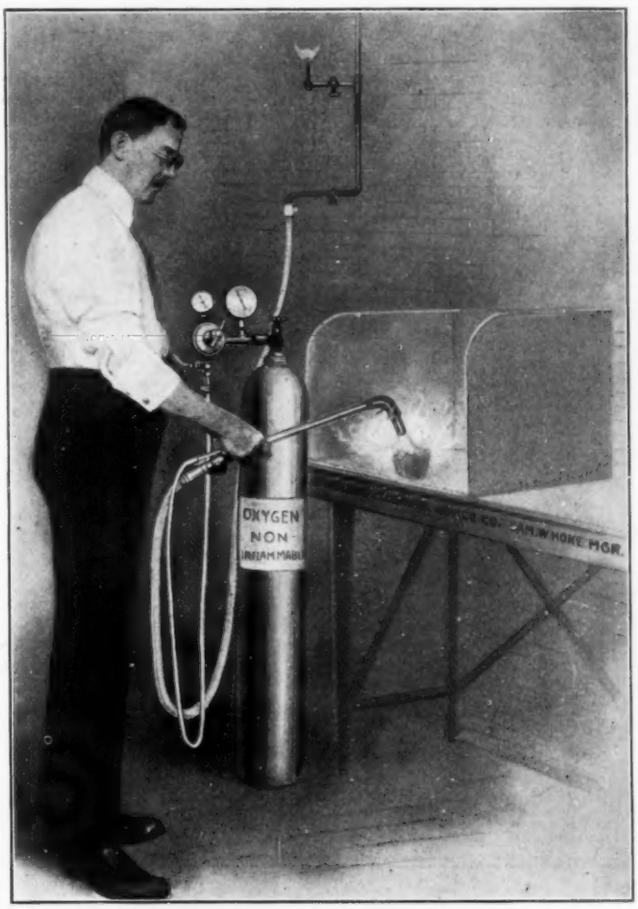
The Hoke-Phoenix platinum melting torch here shown uses ordinary gas in connection with compressed oxygen. It readily produces the high temperature—well over 3,200 degrees F.—which is required for melting this refractory metal.

THE HOKE PHOENIX TORCH.

The torch differs from older forms of the oxygen torch chiefly in that it uses ordinary gas at ordinary pressure, instead of the much more expensive compressed gas or hydrogen; fuel cost, therefore, is reduced to about one-twentieth of what it has been. There are other advantages to this difference, also, in addition to that of cheapness; there is the convenience attendant upon having but one cylinder to keep filled, and the safety that comes from dispensing with the cylinder of inflammable gas. Even with the modern advances in the handling of compressed gases, it is still something of a risk to store inflammable gas under pressure.

In operation the torch is so simple that the average workman learns to use and regulate it in a few minutes. It does not back-fire. A single pennyweight of platinum may be melted economically, or a thousand pennyweight or more may be handled at a time. The texture and density of the metal produced are the same as in the highest quality imported platinum. A second difference between this new model and the older forms of oxygen torches is that the new model requires no change of tip or nozzle when going from a small melt to a large one; the only adjustment necessary is to turn on more gas and more oxygen.

If ordinary illuminating or natural gas is not at hand, the compressed gas or hydrogen can be used with perfect success. As commonly operated, with city gas, on lots of metal averaging 50 pennyweight, the total cost of melting



METHOD OF USING THE HOKE-PHOENIX TORCH

runs to about 2 cents an ounce, being less when larger quantities are melted. The price that many jewelers have been paying is 40 cents to $1 per ounce.

Platinum volatilizes but very slightly even at the high temperature of its melting point, and since the metal is molten for only a few moments, the loss on remelting is practically negligible.

The cylinders of oxygen are commonly loaned, not sold. The one illustrated contains 100 cubic feet, and its internal pressure is indicated by the large dial. The smaller dial indicates the pressure at which the oxygen is *delivered*, while the set-screw below it regulates this pressure and keeps it constant, whether the cylinder be full or nearly empty. It is an economy and convenience to keep this delivery pressure constant.

The torch as pictured can also be used for welding plati-

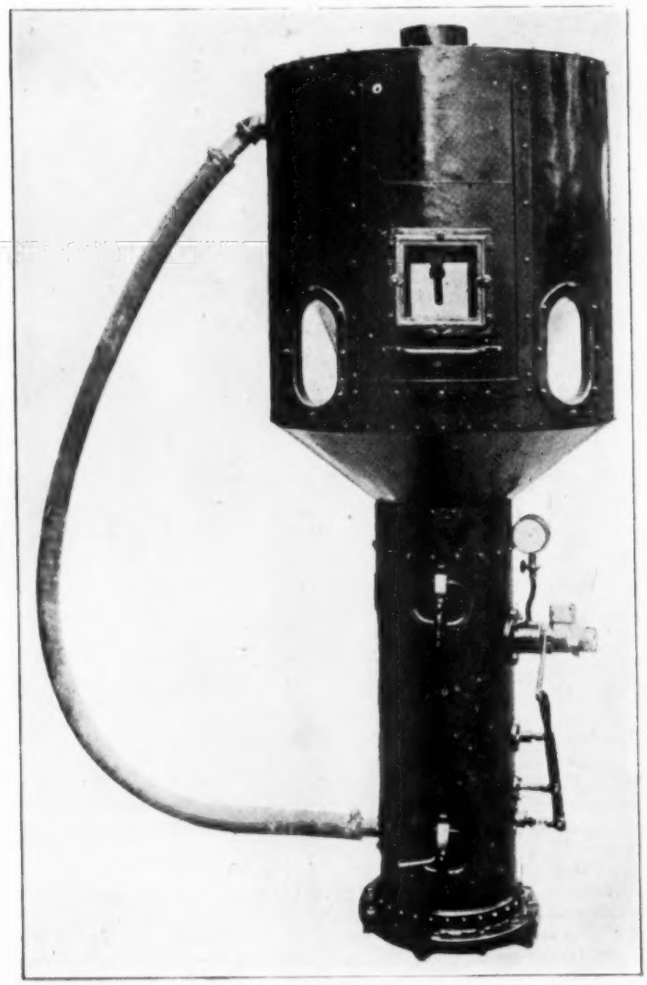
num, and will give a flame suitable for welds of all ordinary sizes.

As the use of platinum in jewelry increases the jewelers are coming more and more to melt their own platinum scrap and filings, and to weld their jewelry with platinum instead of using solder. It is for their use and the use of refiners and smelters that the Hoke-Phoenix has been designed. The outfit is portable, compact, and requires no flue or other equipment; and since its heat is centralized and there are no fumes from its use, it can be operated almost anywhere in a factory.

The Jewelers Technical Advice Co., 14 John street, New York, manufacture the Hoke-Phoenix as described, and supply oxygen in cylinders.

HAND SAND BLAST MACHINE

In many small brass, bronze and other metal foundries castings are cleaned in ordinary rumblers, such as water rumblers, sand blast tumbling barrels, etc. During this process they become somewhat scratched, or the edges are knocked off, and when a smooth dull finish is wanted, these castings, of course, will not suit the purpose. The hand sand blast machine shown in cut overcomes this trouble in an ideal way. The machine



THE HAND SAND BLAST MACHINE MADE BY TILGHMAN-BROOKSBANK SAND BLAST COMPANY, PHILADELPHIA, PA.

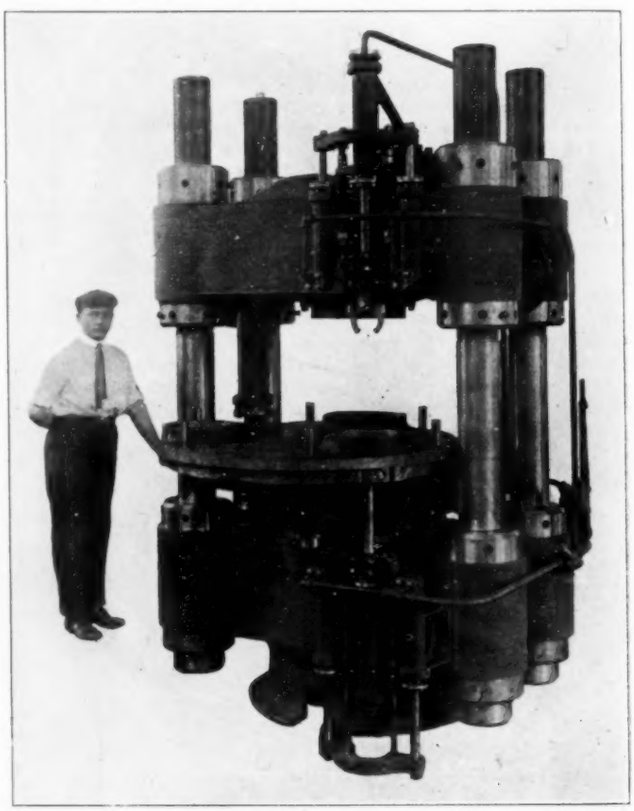
itself is made of heavy metal, consisting of two compartments—the lower, the sand blast machine; the upper, the cabinet.

The sand blast machine, or lower part, is the stock machine manufactured by the Tilghman—Brooksbank Sand Blast Company, Philadelphia, Pa., and a special feature of it is that you are able to fill the machine with sand without closing off the air, thus making a continuous operation day in and day out, if necessary. The hand sand blast machine is made in three sizes, No. 2, No. 4, No. 6. The special feature, as mentioned in the foregoing paragraph, is put in the No. 4 and No. 6 sizes only, as the No. 2 size is too small. The top part or cabinet is made free of any obstruction so that the castings can be put under the blast and cleaned without hindrance.

The machine is operated by pulling upon the valve in the center after the sand has fallen below to the sand tub where it is fed to the air and regulated to suit the work. A small lever will be noticed on the side of the machine which works and regulates the sand flow. When the valve is seated and the air is turned on the sand is carried up through the hose and is blown on the casting which is held in the hands of the operator. The operator wears rubber gloves to protect his hands from the flying sand. He does not need any other protection, as his hands are the only parts of his body that is in the machine. In the very top of the cabinet is an outlet for the dust. This is connected to an exhaust system, making the operation absolutely dustless, and thus far better conditions are obtained than when an open type machine is used. The castings are put in through a door 12 x 14 inches and piled under the blast. The operator has a box on one side to throw the cleaned casting in, and when this box is filled, it is taken out and the machine is replenished with uncleaned work. Any cores or angles are thoroughly cleaned, as the work is held in the operator's hands and he can hold them in any position so that the blast plays directly on them. The hose can be disconnected at the cabinet and used as an open type machine on castings that are too large to be admitted into the cabinet.

1000-TON HYDRAULIC CARTRIDGE CASE HEADING PRESS

The hydraulic press illustrated was designed for the heading of brass shells after they have been indented. The heading operation is accomplished by inserting a fullering block be-



THE 1,000 TON HYDRAULIC CARTRIDGE CASE HEADING PRESS.

tween the head of the press and the top of the cartridge case, the latter being held in place by a suitable die. As the pressure is applied the fullering block causes the brass to flow outward in all directions, thus forming the head of the shell.

The press has a revolving turret with dies to receive three

shells. This provides for an almost continuous operation as there is always one shell awaiting the heading operation and one shell being unloaded, while the other shell is undergoing the heading operation. The rotation of this turret is controlled by an indexing device so that the shell is accurately held in place directly in place beneath the fullering block.

The indexing device is operated by a lever conveniently placed for the operator. By merely pulling the lever the index latch is disengaged from the turret, clearing and releasing the turret for revolving. The photograph here shows a rear view of the press. The lever controlling the indexing device is shown to the extreme right. The operating valve is entirely hidden by the press.

The turret is revolved on a spindle mounted on ball bearings which are set in the front side of the press between the strain rods. The turret is revolved by handles placed around the outer edge at an equal distance apart.

After the heading operation is completed the shell is pulled from the die by an hydraulic ejecting device, which consists of two rams, one attached to the head of the press and the other to the base. Spring gripper jaws are attached to the upper ram for gripping the head of the shell. Each of these rams is provided with two auxiliary pull-back rams. The ram attached to the base of the press forces the shell up out of the die to a point where the gripper jaws on the upper ram can readily take hold of the newly formed head. The pressure is then applied on the auxiliary rams for the return of the ejector rams. The finished shell is then removed from the gripper jaws of the upper ram and the device is ready for the next shell. The use of two ejector rams, each working toward a common center, makes the ejecting operation much more rapid and clears the turret in less time, so that it can be revolved more quickly for heading the next shell. The maximum pressure of the two ejector rams is 5 tons each.

The press is of steel construction throughout. The base and cylinder of the press are cast in one piece. The ram has a diameter of 28 inches and a run of 12 inches. The press has an adjustable daylight of 30 to 45 inches.

The maximum total pressure capacity of the press is 1,000 tons. The number of pressings of which this press is capable per minute depends upon the capacity of the pump used for its operation. As a basis the press will make 3½ pressings per minute with the pump furnishing 19¼ gallons of water per minute at a pressure of 3,250 pounds per square inch.

This press is a new design recently added to the projectile presses now being built by The Hydraulic Press Mfg. Company, Mount Gilead, Ohio.

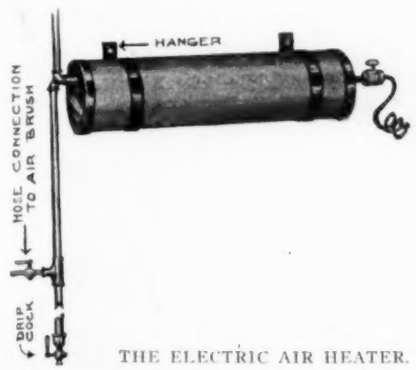
PANGBORN CORPORATION EXHIBIT

The "Pangborn" exhibit at the 1915 Foundrymen's Convention, Atlantic City, September 25 to October 1, is said to be the largest and most complete operating exhibit of sand-blast and allied equipment ever made in the world. The exhibit filled four large freight cars and required 2,000 square feet of floor space (considerably more than was occupied by all the other sand-blast exhibitors put together) and conclusively demonstrated the completeness of the "Pangborn" line of sand-blast and allied equipment. The smooth and shop-like operation was evidence of "Pangborn" capacity and facilities for doing the out-of-the-ordinary speedily, and under the most adverse conditions. It, indeed, was no simple matter. The equipment was put through the shops on short notice without serious interference with a large volume of regular business, and the erecting of the equipment on the pier at Atlantic City was completed in less than five days. Examination of the exhibit revealed the striking features of "Pangborn" products, viz.: Safety of operation, compactness, first class materials and workmanship. The operation of the equipment went far to prove that "Pangborn" equipment has maximum efficiency and makes the best investment.

THE EXHIBIT OF THE PANGBORN CORPORATION AT ATLANTIC CITY, N. J., AT THE FOUNDRY AND MACHINE EXHIBITION, SEPTEMBER, 1915.

ELECTRIC AIR HEATING DEVICE

Persons engaged in the lacquering of metal articles as a part of their finishing have always been troubled more or less by the lacquer smoking or clouding, especially in humid weather, this trouble being more pronounced with lacquers of medium or low grade. In fact, there are cases on record where a lacquer room has had to close down on account of atmospheric conditions which so affected the finishing of their product as to make a cessation of operations necessary.



THE ELECTRIC AIR HEATER.

In view of the above facts it should be welcome news to users of lacquers and similar materials which are sprayed to learn that a new electric air heating device has been recently placed upon the market. This device is attached to the spraying table or booth where the sprayer hose is connected. By means of this device warm dry air is delivered to the sprayer and all lacquer troubles are claimed, by the manufacturer of the device, to be done away with and that shellac and gum lacquers can be sprayed as readily as ordinary lacquer. Paints, varnishes and enamels, it is said, also flow out, giving them a mirror-like finish, which it is impossible to produce without the use of this heater. The heaters are made to suit either direct or alternate current at any desired voltage, and the cost is $25 each.

These heaters are manufactured by the Eureka Pneumatic Spray Company, 62-64 Ninth avenue, New York, N. Y., to whom all inquiries relating to them should be addressed.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.

AMERICAN FOUNDRYMEN'S ASSOCIATION

As a result of several conferences, held recently at Cleveland and Pittsburgh, respectively, by the special committee empowered by the American Foundrymen's Association and the American Institute of Metals to select the time and place for the 1916 foundrymen's convention, it has been decided to meet in Cleveland during the week of September 11, 1916.

At Atlantic City the executive board of the American Foundrymen's Association authorized the appointment of a committee of five to decide upon next year's meeting place, and this committee was instructed by the American Institute of Metals to serve also in its behalf. This special committee is constituted as follows: R. A. Bull, Commonwealth Steel Company, Granite City, Ill., president of the American Foundrymen's Association, chairman; Jos. T. Speer, Pittsburgh Valve Foundry & Construction Company, Pittsburgh, Pa., and Alfred E. Howell, Phillips & Buttorff Manufacturing Company, Nashville, Tenn., past presidents; J. P. Pero, Missouri Malleable Iron Company, East St. Louis, Ill., senior vice-president, and A. O. Backert, Cleveland, Ohio, secretary, American Foundrymen's Association.

The annual exhibition of foundry equipment and supplies, to be held concurrently with the meetings of these organizations, will be conducted under the auspices of the American Foundrymen's Association and the American Institute of Metals. This decision was reached after mature deliberation and represents the unanimous action of the members of this special committee. It also has been approved heartily by J. S. Seaman, Seaman-Sleeth Company, Pittsburgh, Pa., past president of the American Foundrymen's Association, and Jesse L. Jones, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., president of the American Institute of Metals, with whom the members of the special committee met for counsel and advice.

Since the interests of manufacturers of foundry equipment and supplies, who make exhibits at these annual shows, and the members of the American Foundrymen's Association and the American Institute of Metals are mutual, it is the sentiment of this special committee that the exhibitors should share in the profits to be paid in the form of rebates on the cost of their space.

The exhibition will be held in the Cleveland Coliseum, located on Thirteenth street in the center of Cleveland's business district. The Coliseum is within one block of the Hotel Statler, three blocks from the Hollenden and is only a short walking distance from the other Cleveland hotels. It contains 60,000 square feet of floor space on one level and is admirably adapted for a foundry show.

Sealed proposals were invited from corporations and individuals capable of conducting exhibits, to be submitted to the secretary of this special committee, A. O. Backert, Twelfth and Chestnut streets, Cleveland, Ohio, on or before 12 o'clock noon, Eastern time, Saturday, November 13, 1915.

No bids whatever were submitted at the time specified for the opening and none have been received up to the time of going to press, and no definite action has yet been taken by the American Foundrymen's Association for the conduct of the exhibition in Cleveland next year.

INSTITUTE OF METALS

Two research committees have been appointed by the Institute of Metals, the first of which is the Institute's Scientific and Industrial Research Committee. This was appointed by the Council in order to keep in touch with the Advisory Council to the Privy Council Committee on Scientific and Industrial Research, the Advisory Council having invited the Institute to take part in proposing and carrying out—probably with financial assistance provided by His Majesty's Treasury—certain schemes of research in accordance with the Government's "Scheme for the Organization and Development of Scientific and Industrial Research."

The second committee is the Chemical Society's Committee on Metallic Substances. This committee consists as to one-half of members of the Institute of Metals and as to the other half of members of the Institution of Mining and Metallurgy, the secretary to the committee being the secretary of the Institute of Metals.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES

At the Chemists' Club, 52 East Forty-first street, New York, November 10, a meeting of the following well-known industrial chemists was held, at a dinner tendered by the management of the exposition, to discuss plans for the next National Exposition of Chemical Industries: Raymond F. Bacon, Chas. H. Herty, Henry B. Faber, A. D. Little, E. F. Roeber, George D. Rosengarten, T. B. Wagner, L. H. Baekeland, M. C. Whitaker, B. C. Hesse, Adriaan Nagelvoort and Chas. F. Roth; also R. G. Hollaman and F. W. Payne, of the International Exposition Company, were present, all of whom will serve on the Advisory Committee for the 1916 National Exposition of Chemical Industries to be held at the Grand Central Palace, New York City, week of September 25, 1916. At this meeting Dr. Chas. H. Herty was elected to serve as chairman of this committee for the coming year.

AMERICAN ELECTRO-PLATERS' SOCIETY

George B. Hogaboom is preparing a paper on "The Unsolved Problems of the Electro-plater" for the coming meeting of the American Electrochemical Society to be held at Washington, D. C., April 27-29, 1916. In order to make this paper as broad as possible, Mr. Hogaboom has sent out a letter addressed to electro-platers requesting that they submit to him any puzzling problems or questions that they may have encountered. No names will be used in Mr. Hogaboom's paper, but the questions submitted will be treated in as simple and concise manner as possible. Platers and others interested in this matter are requested to correspond with Mr. Hogaboom at 561 Stanley street, New Britain, Conn.

New York Branch—H. H. Reama, president, and William Fischer, secretary, 345 East 23d street, New York, N. Y.

The regular monthly meeting of the New York Branch was held at its rooms, Friday evening, November 26. An interesting demonstration of producing the verde green finish with the sawdust method was given. At the next meeting the determination of the metal content of a silver solution will be given. This branch will hold its annual banquet on February 19, 1916, at the Broadway Central Hotel, 673 Broadway, New York, N. Y.

Newark Branch.—This branch held an open meeting at its laboratory on November 5, 1915. After the business of the meeting had been transacted, a demonstration was given by representatives of the Roessler & Hasslacher Chemical Company, of New York, N. Y., of metal cyanides as are now used in plating operations. Messrs. Proctor, Dittmar and Schneider carried on the demonstration in view of the platers, and obtained very gratifying results. The solution used by the demonstrators was made up as follows:

Water	5 gallons
Sodium cyanide, 128 to 150%	15 ounces
Copper cyanide	15 ounces
Soda ash, 58%	5 ounces

Preceding the demonstration Mr. Dittmar read an extended address on the "Standardization of Copper Plating Solutions," and in the course of this address he made a comparison between the costs of plating solutions produced with copper salts and metal cyanides.

Copper cyanide—70% copper.

100 pounds copper cyanide, at 45c. per pound	$45.00
100 pounds sodium cyanide, 129%, at 26c. per pound	26.00
	$71.00

Cupri-cupro sulphite (termed red copper compound)—40% copper.

175 pounds red copper compound, at 30c. per pound	$52.50
160 pounds sodium cyanide, 129%, at 26c. per pound	41.60
	$94.10

Copper acetate—31% copper.

220 pounds copper acetate, at 25c. per pound	$44.00
193 pounds sodium cyanide, 129%, at 26c. per pound	50.18
	$94.18

By the above figures it will be seen that with chemically pure material the plater not only obtains a solution of maximum efficiency but is able to materially reduce the plating costs.

Philadelphia Branch.—This branch held its 4th annual banquet at the Windsor Hotel, Philadelphia, Pa., December 4. A number of men well known in the plating industry addressed the diners and some interesting facts were told. Our space does not permit us to publish anything more than a list of what happened. Dr. Lukens, of the University of Pennsylvania, spoke on "Electro-Chemistry." Mr. Haddow, of New York, told of what the New York branch had done and was doing. Mr. Fry, of Massachusetts, and Woldstein, New York, spoke on "Lacquers," while Messrs. C. G. Backus and Wm. Schneider, from New York, spoke on current topics. Walter C. Gold spoke at some length on what the Philadelphia branch should do. We publish his speech in full:

"If it were our purpose to assemble around the festive board simply for the purpose of satisfying the inner man, I should consider that this occasion would not be fruitful in achievement. It is a splendid time, I think, to resolve to more thoroughly support the principles and motives of the American Electro-Platers' Society. The special phase of our work, which I desire to call to your attention, as it appeals to me, is that of attendance—the lectures which are being given at the University of Pennsylvania by Dr. Hiram Stanhope Lukens merit a much larger average attendance than that which he has been accorded. I don't believe that any of the branches of the American Electro-Platers' Society have the privileges and opportunities as do that of the Philadelphia branch. The University of Pennsylvania has invited us to hold our meetings in the Harrison building, at 34th and Spruce streets, once a month; it provides light and heat, and a first-class lecturer and teacher in Dr. Lukens. All this is absolutely without expense to our society, and it behooves each and every one of us to be more faithful in attendance. I am sure that there is nothing which encourages the lecturer so much as that of a large attendance and strict attention on the part of the audience. I feel that those who do not regularly attend are doing themselves, the lecturer and the society an injustice. Life is a great school—we are always learning. Anyone who professes that his days of learning are over lacks mental poise—they are well on the road to Old Fogyville.

The business man or employee who is ever on the alert to add to his stock of knowledge considers it a pleasure to come into contact with those who know more of a subject than himself; thus, each month, we are coming into contact with the electro-chemist—the man with whom practical electro-platers must associate in order to materially better themselves. In any profession there is the theory and the practice; thus, in medicine we have the "theory and the practice of medicine." The young man goes to college and associates with practical men—the professors of their profession. Here he learns the *theory* of medicine; he graduates in due course and then becomes a practitioner, which means nothing more or less than that he practices or puts into practice those theories which he studied while at college.

Then there is the theory and practice of the electro-deposition of metals. The electro-chemist teaches the theory, and the platers are the practitioners. Before the organization of the American Electro-Platers' Society, there was altogether too much work done by rote—the work was done by the platers mechanically, without knowing the "whys and wherefores." It was a red letter day, indeed, when the platers and electro-chemists came into contact, for the electro-chemists tell us the "whys and wherefores"—in other words, he teaches us to think and to reason out the actions of electro current on ingredients used in the electro-deposition of metals. When men *think* about their work, then there is improvement; but when they go along and work merely mechanically, then but little progress is made. Therefore, my argument is that every member of our society who misses a lecture commits an act detrimental to himself. While we have but one lecture per month in the course of five or six years, if these lectures are continued, you platers should be head and shoulders above your fellows who do not belong to this organization.

Our study of chemistry relates, of course, to that branch of chemistry styled "Electro Chemistry." I thoroughly believe that every man should study the symbols of the chemicals used in electro-plating. If these symbols are not understood then the lecturer cannot be intelligently followed. He naturally feels that what he is saying is not understood by his hearers, and it is a source of discouragement. When he teaches his daily classes, these men are acquainted with the symbols of chemistry, and they know exactly what the speaker is talking about. Therefore, I am of the opinion that if Dr. Lukens is to make the progress which he desires, we must all familiarize ourselves with the symbols. This knowledge can easily be obtained by the purchase of a text book on chemistry. I hope that all members will give this matter serious consideration. It might be well to adopt a uniform book so that easy reference can be made at any time. If we are to systematically study electro-chemistry, I believe that Dr. Lukens should assign a certain portion of matter to be read over and studied between lectures; then our members can study a bit each month, and in the course of time the whole field could be covered. It would seem to me that such a procedure would be ultimately more satisfactory than simply considering the subject superficially or on the surface only, as it were.

If this suggestion meets with the approval of the society, I should be pleased to take up the matter of the purchase of these books, and I consider that every man in the society should buy one.

Life is made up of constant changes. There are improvements being made in all professions. I recollect that my father was a physician, and each week it was my duty to carry medical pamphlets after he had read them to brother physicians, so that they, too, might acquaint themselves with the latest discoveries and improvements in the practice of medicine. If this business of the electro-deposition of metals is to make the progress which it merits, it must be done by the members of our society all over the country. There is no question but that the business has been put upon a higher plane each year, especially since the organization of the A. E. S. The further improvement in the business must be brought about by the free contact of the platers not only among themselves, but contact on the part of the platers with the electro-chemists. There cannot be a proper forward movement, however, unless our men are willing to improve themselves through the study of electro-chemistry. The day for plating mechanically is over; employers want electro-platers who know the "whys and wherefores" above referred to. They desire men who can tell them why they do this, or why they do that in the prosecution of their work.

In conclusion I would, therefore, urge upon every man to be perfect in his attendance at these lectures; to study electro-chemistry and to thoroughly familiarize himself with the symbols of the chemicals which are used in electro-plating. Let us show the national organization that the Phila-

delphia branch, while not numerically as large as some of the others, is making genuine progress in this work, and is setting an example for the other branches to follow. Let us resolve that we are going to study and keep on studying indefinitely this most interesting subject—Electro-chemistry. We have an electro-chemist whom I believe to be without a peer, and it is our duty to support him to the best of our ability in his efforts to increase our knowledge.

The meeting was at the close of Mr. Gold's speech thrown open for discussion of remarks made by the speakers, and adjournment came at a late hour." [A photograph of the banquet came in too late for publication.—ED.]

PERSONALS

ITEMS OF INTEREST TO THE INDIVIDUAL.

W. L. Abate is now connected with the Haydenville Company, manufacturers of high grade plumbing brass goods, Haydenville, Mass.

DEATHS

JAMES G. HENDRICKSON

James G. Hendrickson, founder of the Ajax Metal Company, Philadelphia, Pa., died on November 4, after a short illness. Mr. Hendrickson was sixty-nine years of age and retired as president of the Ajax Metal Company a little over a year ago and since that time has been chairman of the board. He was also chairman of the board of directors of the Ajax Metal Company, of South Birmingham, Ala., and president of the Ajax Lead Coating Company. Mr. Hendrickson was a bachelor and is survived by one sister.

NATHAN TROTTER

Nathan Trotter, widely known as a business man, and head of the metal firm of Nathan Trotter & Company, died November 26 at his home, "Hillcrest," Towanda avenue, Chestnut Hill, Philadelphia, Pa. He was 63 years old.

Mr. Trotter, member of an old Philadelphia family, was also a director of the Insurance Company of North America.

He was a member of several social organizations, including the Rittenhouse, Philadelphia Country and Racquet Clubs.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

DECEMBER 6, 1915.

Another month's busy days have passed and Waterbury is apparently no nearer the end of the high wave of prosperity than when October ended. It has seen evidences of prosperity in a very successful Old Home week celebration in connection with the dedication of its new municipal building; in the report of bank clearings for November, which show that they have practically doubled those of November, 1914, and total some $6,000,000; in the wonderful massing and passing of freight in and out of the city, but mostly out; in the award of a ten per cent. bonus to its salaried employees by the American Brass Company; in the announcement of another five per cent. dividend to the stockholders of the Scovill Manufacturing Company (the second since October 1), and in divers less striking ways. Prosperity never was at higher point hereabouts than just now, but there may be a new high record set before the winter passes.

There is the same scarcity of labor here that is noted in other cities, particularly in the Middle West, only more so. There is a demand here for sober, intelligent, husky men, the kind who can perform laborious labor eight or nine hours a day and report fresh for the same kind of a trick the next day. The wages for these men run high, so high that a well paid clerk might be envious, in spite of his efficiency as a man of figures, or in other special training that gives muscle no claim. Waterbury is employing anyone who wants to work and is able, and there seems to be some certainty that this condition will continue.

The American Brass Company, the Scoville Manufacturing Company, the Chase Metal Works, the Waterbury Farrel Foundry and Machine Company, the Waterbury Manufacturing Company, the Blake & Johnson Company, the American Pin Company, the Oakville Company, the Plume & Atwood Company, the E. J. Manville Machine Company—all are busy and have many orders ahead. The Plume & Atwood Company is one of those whose resumption of activity in all departments is due especially to the activity in domestic business. The American Ring Company, the Novelty Manufacturing Company, all the foundry concerns and most of the smaller plants, find ample demand and steady improvement in business conditions.

In the absence of labor agitators there is no longer any threat of labor disturbance, and conditions generally are extremely satisfactory. The granting of a ten per cent. bonus to their salaried employees by the executive officers of the American Brass Company has further cemented the good will of the employees and the company, and it will not be surprising if one or more of the other big companies do something similar. At the same time there is some possibility that any further action on such lines will be directed to benefit the mill hands, whether on piece or time scales. Some of these point out that, even with the recent increases in their wages they are really not much better paid, if any, than they were a couple of years ago, or before the slump following the change in the tariff law which led to considerable reductions in payrolls and the laying off of many hands. As there is some justice in this complaint it is not unlikely that unskilled labor will benefit equally with other classes should the present prosperous conditions continue.

There are still some rumblings of rumors as to the reported intention of the American Brass Company to purchase the Bristol Brass Company, but there is no evidence of such steps on the part of those representing either company.

A. F. Rockwell, president of the Bristol Brass Company, recently purchased ten acres of land in Plainville, and rumors were thereby started that the tract would be used for a new plant, to be operated by a new corporation, presumably engaged in metal manufacturing. It is expected that Mr. Rockwell will announce his plans before the first of the year.

Most of the factories of Waterbury closed for Thanksgiving Day and for Saturday, November 27, the last day of Old Home week, but in some of them the employees had been worked overtime several nights in advance to prevent any loss in output on account of the shutdown. Major John P. Elton, of the American Brass Company, was the host of Gov. Marcus Holcomb and his staff during the celebration.—F. B. F.

HARTFORD, CONN.

DECEMBER 6, 1915.

Although it cannot be denied that the big European war is directly responsible for considerable of the rush in the Hartford metal industries, Thomas J. Kelley, manager of the local bureau of the Manufacturers' Association of Hartford County, says that much of it is natural growth. In the cases of those companies which are engaged directly in the filling of war orders, such as Colt's Patent Fire Arms Manufacturing Company and the Pratt & Whitney Company, the increase is due, of course, largely to the war. But in other factories, which are not directly filling war orders, the increase is not abnormal. Hartford's prosperity, in other words, is not due entirely to the war.

There is a wide difference of opinion as to the degree to which the industrial prosperity here, outside of the companies filling war orders, is due to the war. One theory is that it is entirely due to the war, because the war has opened new markets and has, at the same time, had the result of a high protective tariff. Another opinion is that the prosperity in metal industries is due only in a small degree to the war and can be traced almost entirely to a revival of business confidence and to the excellence of Hartford products. In some industries few, if any, new markets have been opened up by the war. Yet these industries are prosperous. One of them has increased its output for one country 1,400 per cent. in the past ten months. The product, which it manufactures, was never made in that country, either before or since the war started. It is not a product used in the war.

The typewriter factories are examples of plants which are not engaged in the manufacture of articles used in war. Last winter the typewriting factories in Hartford were working part time; now they are on full time. As a matter of fact, their prosperity was hindered, for a time, by the outbreak of the war.

In the past nine months, approximately 5,000 employees have been added to the manufacturing plants of Hartford. There have been added to the factories in the form of expansion nearly 2,000,000 square feet of floor space. At present, Hartford has 23,000 employees in its metal industries. In rough figures, the aggregate payroll amounts to $30,000,000 a year.

But, despite all these evidences of prosperity, the manufacturers are still struggling with strikes. The Pratt & Whitney strike remains unsettled with absolutely no prospect of being cleared up. More than 1,000 men are on strike and it is said that a large number of them have accepted work in Bridgeport, where the eight-hour day has been granted by most factories.

Early in November the Hartford newspapers carried articles to the effect that students from Trinity College in Hartford had volunteered to work for the sake of breaking a strike in one of the departments of the Pratt & Whitney Company. The strikers became quite agitated about the matter, and when the time came for the student strike-breakers to report, only a few of them put in an appearance.

The Hartford Auto Parts Company has not yet removed from the Colt's West Armory to the new factory which has been built for it in New Britain.

The Pratt & Cady Company has bought from the Cushman Chuck Company the latter company's old factory on Cushman street and will occupy it immediately. The building will be used for the present for shipping and storage and later for light manufacturing. The consideration was in the neighborhood of $30,000.—T. C. W.

NEW BRITAIN, CONN.

DECEMBER 6, 1915.

With the passing of Thanksgiving and the advent of the winter season, New Britain's captains of industry and workingmen have reason to be thankful. The outlook is very bright. Business is brisk at the factories and no one who wants a job, whether he be skilled mechanic or common laborer, need be out of employment. Wages now being paid here are better than at any previous period in the past few years and many employees are getting extra money and bonuses for overtime work. At the present time it is extremely hard to say definitely whether or not the improved business coonditions are due to war orders. All manufacturers are loth to admit receipt of war orders, but it is safe to say that a number of the concerns are still being indirectly benefited by receiving sub-contracts from other concerns receiving the actual orders. However, it may be safely said that the greater bulk of the present boom is due largely to general improved conditions in trade.

The Skinner Chuck Company is employing at present the largest force ever on its payroll and represents a gain of twenty-five per cent. over the normal working force. Working time has also been increased about three hours per day at this plant. At the New Britain Machine Company 800 hands are being employed. This is 200 more than the usual number of workers. At present a night shift is employed. Business at the Russell & Erwin Manufacturing Company is normal and a fifty-five hour schedule is being maintained. It is reported, and not denied by the officials, that this concern has received a $200,000 order for hardware for the new municipal building at Pittsburgh, Pa. Full time schedule is in vogue at the Stanley works, where 2,000 hands are employed, and the same holds true at Landers, Frary & Clark's. Here the payroll contains 2,000 names. There is some improvement noted in the business at the Stanley Rule & Level Company, where 1,100 hands are working fifty hours a week, and at the Corbin Cabinet Lock Company one department is working overtime.

At the comparatively new plant of the Hart & Hutchinson Manufacturing Company business is rushing and there is a demand for skilled help. A night force is employed in some of the departments and the japanning and shipping departments are working regularly until 9 P. M. This company is one of the most rapidly growing concerns in the city.

The Fafnir Bearing Company, another comparatively new concern, is also feeling a prosperity boom. This plant deals mostly in the manufacturing of all sorts of bearings. The automobile industry causes a big demand for their products, and it is also said that some of their heavier bearings find their way to the European battlefields as part of the equipment of the big guns.

Showing that the aforementioned Stanley Works is really doing a flourishing business, Clarence F. Bennett, superintendent, says: "Business conditions are good with us. Building permits were issued today for the erection of three new buildings immediately required for the production of the orders received. The structures will be 147 x 20 feet, 180 x 20 feet, and 45 x 20 feet, respectively."

Thus, from a glimpse of the business that is being done, it is obvious that New Britain's industries are faring well and that the outlook for the winter trade is such that, nothing unforeseen occurring, the employee may feel certain that he shall not want for work this season.—H. R. J.

PROVIDENCE, R. I.

DECEMBER 6, 1915.

The metal trades industry throughout Rhode Island is one of great activity, and there are few of the plants which have enough men to work the number of hours that should be worked in order to meet all the demands on time. It has been many years since there has been such a general rush call as there has been during the past year. Even during the recent disturbances connected with the labor controversy there was no cessation in the number and size of the orders which were continuously poured in on the state, and as a result there has been a steadily increasing demand for skilled workmen.

The labor troubles, fomented by professional agitators with their misrepresentations, misstatements and specious arguments, are things of the past, a welcome relief to the plants, the men, and their families. It is said that practically all of the men who went out on strike are back at work now, and there appears to be nothing like trouble of any kind in sight at the present time. All of the factories are rushed with orders that are, for the most part, going abroad, and from now on there will be a determined effort made to keep things going on the part of the various manufacturers.

The jewelry industry, which was the last to respond to the

magic wand of returning business activity, continues to show increased prosperity and there are now more plants that are working overtime than there were a month ago. Many of the smaller plants are seeking larger quarters, due to the rush of business that is now being experienced. The manufacturers are making unusual efforts to bring about a continuance of the present conditions, as is evidenced by the meetings which have been held recently looking toward a movement that will make the wearing of jewelry more popular by means of a campaign of publicity. In addition the members of the New England Manufacturing Jewelers' and Silversmiths' Association are looking into the possibilities of securing more business from abroad by a systematic co-operative plan.

The H. J. Astle Company, of this city, has been especially busy during the past month and has installed a number of its blower, polishing and ventilating systems. Included among the number were a Boland pressure blower at the Hopedale Manufacturing Company, Hopedale, Mass.; Boland sand blast in manufacturing jewelry plant of Fletcher-Burrows Company, Providence; Boland exhaust and dust collecting system for the American Optical Company, of Southbridge, Mass.; Boland ventilating system for the soldering room of the Mason Manufacturing Company, manufacturing jewelers, this city, and a polishing and dust-collecting system in the jewelry plant of the S. & S. Novelty Company, Providence.

The New England Ventilating and Heating Company, 926 Manton avenue, has recently installed a Richardson fan in the coloring room of the manufacturing jewelry plant of the Cory & Reynolds Company on Niagara street. It has also installed an emery dust ventilating system at the Builders Iron Foundry on Codding street.

A full time schedule is now being maintained at the works of the R. Plews Manufacturing Company, Central Falls, R. I., manufacturers of tin cylinders and metal workers, and the conditions are such that the plant will have to be operated overtime in the near future in order to keep pace with the increasing demand for the firm's products.—W. H. M.

BUFFALO, N. Y.

DECEMBER 6, 1915.

Trade conditions in this market are very much better than that of a year ago. Everywhere you notice a tremendous improvement over the prevailing conditions during the summer months. In fact, some of the concerns are so busy and flooded with orders that they will continue to be busy for the next six or seven months to come.

As to whether this increase in the volume of trade is due to the war there is much difference of opinion. Some say that it is due to the war, others say it is not, while others maintain that they don't know if it is due to the war or not, as they are not sure as to the final source to which their wares will be taken, and then another opinion is that the war started this boom and that the present business is fast becoming normal.

But there is one opinion upon which all local men agree—that the war has caused an advance in the price of metals and that this advance of price is bound to affect the metal men in two ways. First, it is bound to be a source of inconvenience to the concern which is under contract to supply goods at a certain price because it will mean that this concern which is under a long term contract will not be getting the share of profits to which he is justly entitled, and especially so if his stock of metal is low. Then another effect the advance of price will have on the metal men is that buyers will be very apt to hold up their orders. They will remain reluctant about placing orders as long as metal prices are soaring sky high.

Nearly every foundry in this city is working to capacity. It has been a long time since some of them have been "swamped" with so much work, and it is the general opinion that this revival of trade will continue to prevail throughout the winter.

Schnell Bronze Bearing Company, Inc., have nearly doubled their volume of business in comparison with that of a year ago. The National Bronze Foundry are booked up with orders which will keep them busy until next spring.

Titan Copper Products Company, Inc., report that last month was better than the same month a year ago.

The Unique Brass Foundry Company have booked enough orders to keep them busy until next May. The foundations for their new $30,000 foundry have been laid. They expect to occupy their new quarters within the next two months.

The Zero Valve and Brass Manufacturing Company is working its forces 14½ hours a day in order to keep pace with their influx of orders. They are making thousands of parts of brass and bronze, also, they are working on a dozen large orders for filters, etc. "And do you know," said W. H. Peeples, the general superintendent, "that it is very difficult to get real metal mechanics? I never saw such a famine for high grade skilled labor."

Such platers as Flander Manufacturing Company, Fries & Company, Washington Plating Company, etc., report that their business is very much better than it has been in months. S. A. Day Manufacturing Company has moved from 23 Desmond Place to 1483-1485 Niagara street.

Crosby & Company are making a one story brick addition (60 x 125 x 14) to their annealing plant. It will cost $5,000.

The National Corundum Wheel Company has changed its name to the National Grinding Wheel Company, Inc.—G. W. G.

NIAGARA FALLS, N. Y.

DECEMBER 6, 1915.

Business in this market is becoming more normal each week. While war orders continue to play a part in the present business yet a large volume of it is the old staple—normal trade. This steady return to the old lines, it is believed in this market, will continue to increase throughout the winter.

Every metal establishment in this city reports that their volume of business has increased in leaps and bounds over that of a year ago.

Arthur Wright reports that his plating department is unusually busy, also, that his jewelry manufacturing department is quite busy.

The Niagara Searchlight Manufacturing Company is one of the busiest establishments in the Cataract City.

The Spriella Manufacturing Company report that this last month was very much better than that of a year ago.

The Niagara Electro-Chemical Company are making a number of additions to their present establishment. The new additions will be ready to occupy by the first of the year.

The Frontier Brass Foundry and the Titanium Alloy Manufacturing Company continue to be as busy as ever. The Titanium Company has moved into its new office building.—G. W. G.

COLUMBUS, OHIO

DECEMBER 6, 1915.

The metal market in Columbus and central Ohio is active to the extreme. There is a much better demand for all varieties of metals and prices are correspondingly strong. The prospects for the future are good in every regard.

War orders are one of the best features of the trade at this time. Munition factories are good customers and in fact there is a demand for many kinds of metal in every line of fabrication. The supply is rather good, although some shortness in supply is reported in certain quarters. On the whole the tone of the market is good.

Copper and spelter are especially strong and the volume of business is gradually increasing. Scrap copper is quoted between 17½ to 19¼ cents. Spelter is in good demand and aluminum is especially strong, being quoted almost as high as 50 cents for ingot. Yellow and red brass are strong, the former selling at 12 to 14 cents and the latter at 13½ to 14½ cents. All white metals are stronger. Lead and tin are in better demand. Babbitt metal is one of the strongest points in the market.

The Ohio Metal Products Company, located at 39 Edgar street, Dayton, Ohio, has increased the output of its plant by about 80 per cent. by the erection of a large building, adjoining the present structure. The structure will be of brick and steel and will be fireproof construction throughout. J. H. Dohner is president; S. W. Dohner, vice-president, and Bert E. Dohner, secretary-treasurer.—J. W. L.

DETROIT, MICH.

DECEMBER 6, 1915.

Trade conditions have a healthy tone, as the metal trade factories at the present time are running to their full capacity. War orders for automobile accessories and shell parts have contributed largely to the prosperity of Detroit and has now boosted it to the third export city in the United States.

This sudden boost has made it the fourth greatest manufacturing city in the country being outranked by only three cities of several times her population. Detroit's manufactured products this year will pass the half billion mark. This has all come about because Detroit has procured her goodly share of the golden flood that has poured into this country from Europe since the first of the year. Detroit has never been subject to business slumps, but never has its streets been so filled with chugging motors and hurrying throngs, hotels so crowded, factories and terminals so busy as today. No emissaries to European governments were necessary to get foreign orders for Detroit. The city was known as the place where motors come from, and here the buying agents of the Allies come seeking the modern wheels of war trucks to carry shells to the front and ambulances to bring back wounded men.

The motor makers and manufacturers do not seem to anticipate any trouble from cranks or spies. Here one company at least is taking hundreds of visitors through its plant every day, and the only question asked is, "What make of car do you own?"

W. H. Roberts, secretary of the Roberts Brass Manufacturing Company, located at W. Fort street, manufacturers of high grade brass goods, the other day remarked that the sweetness of low prices never equal the bitterness of poor quality or poor service, and it is a truth that should be remembered by those who purchase brass goods. This firm deals with jobbers in all parts of the country and ultimately the goods go into the hands of the general public.

Mr. Roberts also stated that better business conditions are shown throughout the country by the increasing number of orders that the firm is receiving. A great many of the firm's customers are jobbers in steam, plumbing and mill supplies; they also make brass parts for motor car manufacturers and for the gas stove industry.

The Superior Stamp & Seal Company, located at Jefferson avenue, manufactures small metal stampings of all kinds. It has among its customers some of the biggest users of metal tags in the country and turns out for them thousands of tags daily.

They have added new equipment, which embraces all the latest improvements in their line. Realizing the heavy demands on the metal market for materials and high prices, the company contracted for a large supply early in the season and has had no delays in procuring metals.

O. E. Hanfield, manager of the company, says business is good and there is every indication of conditions generally going to be prosperous all over the country.

The General Aluminum and Brass Manufacturing Company is running its plant to its full capacity.—P. W. B.

The large number of orders received by brass, copper and aluminum manufacturers here is regarded as some indication of the general improved conditions throughout the United States. While a large number of plants are engaged on war orders, they also are receiving and filling more general orders from various parts of the United States than at any previous time at this season of the year. The general expression throughout the West is that business is improving constantly, with every indication of a good run of orders through the winter and early spring.

W. H. Roberts, of the Roberts Brass Company, is exceedingly optimistic regarding the future. His company is aggressive and is adopting every method known for improving efficiency and the expansion of business. He has recently made a distinctive study of business conditions throughout the country and declares there is nothing to fear regarding the future.

The Superior Seal & Stamp Company, of 241 Jefferson avenue, is increasing its facilities for producing metal tags and other equipment used in the automobile industry. They recently have installed a new stamping machine and are preparing other expansions.

Within the last year or so there has been an unusual increase in the production of jewelry and optical goods in Detroit. While this business has shown a steady growth from year to year it was not until within the last several months that a heavy increase in business was apparent. The growth of this line has necessitated the enlargement of a number of plants. At present Detroit is the admitted leader in the manufacture of emblems and fraternity jewelry.

The enameling and japanning plant of Barney Nehls at 248 Brush street has added to its equipment and floor space within the last month or two. He is now supplied with every modern appliance for handling his increase of business. He reports large orders and has every prospect of a heavy run of work throughout the winter.—F. J. H.

CINCINNATI, OHIO

DECEMBER 6, 1915.

War orders, in so far as they mean the direct manufacture of shells and other munitions by local machine shops, are probably on the decrease; but operations are continued at as nearly three shifts as possible in the manufacture of machine tools required in the manufacture of munitions, so that business resulting from the war may still be said to dominate the situation completely. The only plants not running overtime to a very considerable extent are those which have been unable to secure the necessary number of men for that purpose. With prospects for general business improvement as flattering as they are everywhere reported, there is hardly a branch of the metal trade, from the foundry to the machine shop, that is not looking forward to uninterrupted continuation of the present remarkable activity. Higher prices of all metals has had no restraining effect on the demand, apparently.

H. H. Suydam, president of the Cincinnati Manufacturing Company, a leading metal-working concern of the city, is one of the committee recently appointed by the president of the Business Men's Club to take up the matter of the proposed consolidation of that body with the Chamber of Commerce. Most of the prominent business men of the city are members of both organizations, and one object of the consolidation would be to make this dual membership unnecessary.

The Buckeye Foundry Company, one of the local concerns which has been rushed heavily for several months past, has let the contract for the construction of an addition to its plant, 50 by 100 feet, at a cost of $10,000, to enable it to keep up with its business. The structure will be of steel and brick. K. C. K.

LOUISVILLE, KY.

DECEMBER 6, 1915.

There has been a big improvement in the metal industry of Louisville and vicinity during the past few weeks, and most of the local coppersmiths are now very busy. Distillery repairs work has broken nicely for the trade, and nearly every one of the concerns which handle this type of copper work is now good and busy. Concerns are figuring on a good many large contracts which are about to be awarded, and from general indications the next month or two are going to be very busy ones for the trade.

Sheet copper has been climbing steadily during the past month and advances of fractions of cents have been posted almost daily. The price is now quoted at 25 to 26 cents per pound, and a number of the copper men are looking forward to see this price advance considerably. It is claimed that coppersmiths are bidding on large jobs all over the country, and as soon as these contracts are awarded the price is bound to advance, as the available supply of copper at this time is not equal to the big demand which has been brought out by the war.

Hines & Ritchey report that they have a large number of small jobs on hand just now. A number of these jobs are on distilleries belonging to old customers of the house. No new distillery work to speak of is coming out.

The brass foundry of Falls & Withers is doing a good deal

of special bearing casting just now for the Abell Elevator Company, of Louisville, a concern which has been very busy this fall.

All the gold and precious metal working shops of Louisville, representing the manufacturing jewelers, are now busy with their annual fall rush for the holiday trade. Several of the shops which were only working part time during the summer are now working full forces.

Although business was very quiet a few weeks ago with the Independent Brass Foundry, such is not the case at this time, according to J. W. Rademaker, the manager. Mr. Rademaker reports that he is now working on a large government contract for bronze and other special metal rings, metal packings, etc., to be used on government vessels. He is also making a lot of brass castings for the Cheatham Electric Switch Company, a concern which has taken on a lot of business from electric street railways during the past few weeks. At Lexington, Ky., James Love has leased the plant of the Eagle Casting Company. The plant will be managed by William Lyons, of Ashland, Ky.

The Hull Pump & Tank Works, of Owensboro, Ky., which was recently incorporated to manufacture and market a newly patented oil pump, has placed a contract with the Southern Foundry Company, of Owensboro, for the castings to be used in the pump. The Aluminum Company of America, at Maryville, Tenn., has installed a new furnace building which will increase the capacity of the plant by about 20 per cent. The company will employ seventy additional men in the new department, work on which has been started.—J. D. C.

PHILADELPHIA, PA.

DECEMBER 6, 1915.

According to the opinion expressed by members of the metal trade in this city, there is at present existing quite a large foreign demand for their products, which they expect to contine unabated through the winter season, at least. Just at this time the majority of the manufacturers have found a big market abroad for copper and spelter and are taking advantage of this condition to concentrate their attention on the shipment of these particular products. The question now predominating the minds of the local men is whether or not they would be justified in running big on these products with the existing high market prices. Many are of the belief that the present price on copper is a fictitious one, being due entirely to the foreign demand. Should the latter slump at any time, the market will take a corresponding tumble, and the unfortunate manufacturer who has pinned his faith on copper and spelter will be forced to sell his products in this country at a very low price.

The State Department of Delaware recently granted a charter to the Harding Metal Products Company, permitting the latter to operate under its laws. The new company, which will engage in the manufacture of copper and brass at Wilmington, Del., has been organized with a capital of $25,000 by R. M. Harding and H. Bonsall, of Philadelphia, and J. M. Frere, of Wilmington.

As the result of a recent fire, which broke out in the stables of the Girard Metal Company, at 1016 East Susquehanna avenue, this city, the property was damaged to the extent of $15,000.

A new industry is about to be launched among the trade under the title of the Niagara Manufacturing Company, the object of which will be the manufacture of metals of every description. Included among its incorporators are F. R. Hansell, George H. D. Martin and S. C. Seymour.—P. N. S.

TRENTON, N. J.

DECEMBER 6, 1915.

Nearly all of the Trenton plants where metal workers are employed were affected during the past month by the general strike of machinists throughout this section. All local union machinists sent demands to the employers that they desired an eight-hour day at the same rate of pay. When this was refused they walked out, crippling the plants. One of the biggest plants to be affected was that of the J. L. Mott Company, where skilled mechanics are working overtime because of war orders. When the machinists quit work the brass finishers were compelled to quit in the night gangs because of a lack of necessary tools and because the machines could not be kept in proper order. Then efforts on the part of the Mott officials to compromise with the machinists proved futile. The company's offer embraced a fifty-hour week instead of the forty-eight in the demands, and wanted the men to work the extra four hours at the overtime scale of wages as fixed by the union. A few days later the company sent for a committee of the men and said it would grant the eight-hour day. This arrangement now makes work for many more hands, because of the fact that the employees have to be divided into three shifts of eight hours each.

The John A. Roebling's Sons Company also granted a fifty-hour week and prevented a tie-up. The Roebling company owns the Trenton Brass and Machine plant and the strike was settled before the latter works were affected. The Mercer Automobile Company also granted fifty hours to not only the machinists but to its 350 other employees, including brassworkers. The Roebling company, which suffered a $600,000 fire a few weeks ago, is utilizing a part of its copper cable shop for the manufacture of wire rope. As soon as the cable shop is completed the Roebling company will increase its orders to the Raritan Copper Works, where the material is purchased.

The brassworkers, metal polishers and moulders employed at the Mott plant are framing up a new agreement, which will be presented to the concern in a short time. The nature of the demand is not known. It is said that the employees are now taking advantage of the busy season to make demands and have them stand by a signed agreement. The local metal concerns are busy on war material and will sign almost any kind of an agreement to prevent a strike and a delay in filling orders.

The Mott company is figuring on another big order for war munitions, and should the local concern be successful it will give work to many more additional men. The firm is receiving great quantities of brass to be used on time fuses. The present war order was greatly delayed by the slow shipment of special machinery made for that purpose in Pennsylvania.

While the great European conflict is responsible for considerable work in this city along different lines, it also figures somewhat in the metal industry. At the Mott plant the brassworkers and metal polishers find times better than in many years. With the eight-hour shift plan, men not only make good wages along the lines of piece work, but also have shorter hours. They previously worked longer hours for less pay. The force here is greatly increased monthly and the Mott officials expect a busy time for at least two years to come. Other lines of work at the plant are picking up.

The Trenton Brass and Machine Company is very busy. The Roebling company is installing special machinery in its six-story wire shop, and some of this is being manufactured at the Trenton Brass and Machine plant. The war has also increased greatly the output at the plant of the Trenton Smelting and Refining Company. Another plant where the foreign conflict has more than doubled business is that of the Ingersoll-Trenton Watch Company. The Billingham Brass and Machine Company is working on orders for the United States Government. The Skillman Hardware Manufacturing Company has a rush season on and part of this increase can be laid directly to the war. The company is shipping considerable hardware to the towns where the big powder companies are erecting plants and dwelling houses. Taking all in all, business along the metal lines is very good.—C. A. L.

NEWARK, N. J.

DECEMBER 6, 1915.

There has been a great improvement in business conditions in this city during the past month, and while it would be stretching the truth to say that the long-heralded boom in business has arrived, it is easy to believe that we are at the threshold of good business which might easily grow into greater prosperity than has been seen in these parts in a number of years. Many manufacturers and business men state that business has assumed normal proportions with them following a period of depression, while many others report that the volume of business they have done this fall has been from 25 to 100 per cent. ahead of that done in the corresponding months last year. Some report bigger business than two years ago at this season. While this is all true, it remains to be said that a few lines have lagged

behind the general trend of business, and some others report business but moderately good and improving but slowly. In some of the lines that are doing very well, business is not as steady as it should be in good times. But the improvement is so great, when the situation as a whole is reviewed, that it gives ground for great optimism. Many concerns are working overtime, and some men find it hard to get sufficient skilled help to turn out their orders promptly. Jewelry and silverware manufacturers are very busy, as a rule. Many find it difficult to get trained employees enough to turn out the orders, on account of the fact that during the dull times these men drifted into other lines of work. Electro-platers are doing much better than they did during the spring and summer months, as is usual in the fall season, but compared with what this business ought to be at this season of the year conditions are only fair. Workers in metals outside of the precious metals find business generally much improved. The high prices for some of the materials tends to check normal development along some lines. The demand for spelter and chemicals of various kinds for munitions of war has hit, to some degree, other industries which need these articles for their fullest development, but who cannot afford to pay as high prices as will the munition manufacturer. While there are munition factories in considerable number near Newark, few contracts have been placed in Newark for this class of goods. Other articles for the use of the belligerents are made in Newark, however, and parts of different kinds of war material which is assembled elsewhere. While the war order trade has been a great stimulus to business in general, it cannot account for all of the improvement which has been shown in business conditions.

Collections have been very slow, even those firms which have been doing the best, making this complaint. Of late, however, there has been a little easing up in this direction. The key to the whole situation now seems to be confidence. And it begins to look as if the people were beginning to discount war rumors and other unsettling issues and were slowly but surely regaining the confidence which has been so lacking and so detrimental during the past year. Many manufacturers are reporting more actual orders and many more inquiries. Many retail stores are beginning to cautiously increase their orders for stock. Manufacturers here and there are taking on new employees, one or two at a time, and it is probable that this tendency will increase as the fall season gets nearer. The conditions described above are for trade in general. Those concerns which are filling war orders are generally very busy and have taken on large numbers of employees. Agents of the belligerant powers have been busy in Newark trying to get the various manufacturers to make war material of different kinds. More of such material is now being made than at any other time since the war began, but many manufacturers, either because they did not believe in making war supplies, or because they were not equipped to make them and did not want to go to the expense of making extensive additions to their plants for a temporary business, have turned down orders offered. A number of concerns which do not make war material themselves prepare the metal or make the tools for other concerns which do make it. Many manufacturing jewelers have been approached and asked to make shells and other forms of ammunition, and while there are persistent rumors that a few of them have agreed to do so, it is hard to find any who will admit it. Some say that they would have signed a contract to make such goods if it were not for the expenditure of a considerable amount of money for special machinery which would have been necessary. Others who had practically decided to make the goods found, on investigation, that such large quantities of ammunition are being made in the United States that it is impossible to get the brass for shells and some of the other materials needed unless a sufficiently large order were placed to warrant the manufacturers of the ammunition ingredients to enlarge their plants. This, some felt, was too big a proposition for them to handle.

J. E. Ferriday, lapper and polisher and gold and silver plater in the Richardson building, Columbia street, says business is fair at present but has no push behind it.

The M. A. B. Metals Company, 48 Mechanic street, reports that business is spotty yet, though the firm is doing fairly well. It is thought that the fall will be good, and that just before Christmas the firm will be very busy.

The Dirigold and Metals Company, who recently purchased the plant of the bankrupt Renziehausen Company in Oliver street, reports that business is opening up very well.

V. Newman, gold plater and colorer in Academy street, reports that business is spotty yet, though there has been considerable work. Some days there will be comparatively little to do and at other times for several days at a time he will be very busy.

J. W. Rosebaum & Co., manufacturers of jewelry and metal novelties, Austin and Astor streets, report business is somewhat improved.

E. Newton & Son, gold and silver platers, refinishers and polishers, at 43 Lawrence street, report an improvement in business and are looking forward to good business during the coming fall. This firm does repair and replating work for many New York City jewelry stores and refinishing of silverware for New York hotels.

The Rohrback Plating Company is the trade name which has been filed for the electro-plating business at 274 Market street by Charles A. Rohrback, of 174 South Orange avenue. William Yeager, nickel plating, polishing, oxidizing, lacquering, etc., in Mulberry street, reports that business is good, but not rushing. Hodecker Brothers, electro-platers, polishers, etc., 373-375 Market street, are going to install a large new dynamo. They report business is very good at the present time. The Waclark Wire Company, of Elizabeth, N. J., which has just completed a new brass casting shop, has now begun the erection of a large brass rolling-mill. The new building will cost $25,000. Smith, Brannan & Strein, electro-platers and polishers at 105 Oliver street, is very busy at the present time. A large number of orders have been received recently for re-plating silverware.

The Newark Nickel Plating Company, 32 Walnut street, reports business much better than it was during the summer, but not up to normal for this season of the year. There is nothing, it is stated, to show whether present conditions will be permanent. An order confirming the sale of the assets of John O. Pearson, who conducted a brass foundry at 147 New Jersey Railroad avenue and went into bankruptcy on October 16, has been signed by Referee Charles M. Mason. The assets sold for $247.50 single. The sum of $225 had been offered for them in a group. The liabilities were placed at $1,022.93.

William H. Force has just started in the business of manufacturing metal novelties at 93 Chestnut street. Mr. Force was formerly with L. A. Meyers, metal novelty manufacturers at 139 Ogden street, this city.

The Continuous Casting Corporation, whose main office is in the Kinney Building, are now operating their plant recently equipped with continuous casting machines at Garwood, N. J. This machine, which is the invention of Grenville Mellen, has been described several times in THE METAL INDUSTRY, an extended account appearing in the June, 1915, issue.

The Mellen machine, it will be remembered, produces a continuous rod section of copper, brass, bronze or other metals by pouring the metal in one operation into rods ready to draw into wire. The machine is equipped with a receiver into which the molten metal is delivered from any suitable form of melting furnace. From this receiver it flows into a continuous mold formed by two sets of mold sections—each of which forms half of a continuous two-part mold—that are carried on two endless chains. The metal is carried along on this traveling mold and passed out in the form of a solid rod which can be carried on directly to the draw blocks. The mold sections run over sprockets and are returned to the starting point where the molten metal is being delivered into the mold. As long as the machine is kept running and supplied with molten metal a continuous rod will be produced.

B. J. Riley, of the B. J. Riley Manufacturing Company, manufacturers of metal goods and novelties at 251 New Jersey Railroad avenue, states that business is much better than it was a few months ago, but that it is not yet what it ought to be. The price of materials has gone so high that it has been necessary to raise prices on finished goods. This at first caused much complaint, but people are beginning to realize that this is not an arbitrary raise, but is due to the high cost of materials.—R. B. M.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Atlas Brass Foundry Company, Columbus, Ohio, is building a three story fire-proof addition to its machine shop.

The Newell Manufacturing Company, Ogdensburg, N. Y., contemplates the erection of a factory at Prescott, Ont. This company manufactures brass goods.

The Raritan Copper Works is constructing a 112 x 210-foot addition to its No. 2 casting building at Perth Amboy, N. J., the estimated cost of which is $90,000.

C. S. Rinebold, of Lima, Ohio, will improve the Selfridge handle factory and install a brass and aluminum foundry and operate under the name of the Rinebold Casting Company.

William L. Koch, permanent receiver for the Niagara Motors & Manufacturing Company, Dunkirk, N. Y., has issued a call for a meeting of the creditors on January 15, 1916. Mr. Koch expects to shortly completely wind up the affairs of this company.

George Vits, president of the Aluminum Goods Manufacturing Company, Manitowoc, Wis., reports that plans have been completed for the erection of a five-story fireproof building, 55 x 300 feet, at Manitowoc, which, it is expected, will be started next spring.

A brass foundry is being constructed by the Camas Brass Works, Camas, Wash., and will have a capacity of 2,200 pounds. John Rohrberg, proprietor, states that he is in the market for equipment for a tin shop and also for a small brass and cast iron machine shop.

The Coleman Foundry Equipment Company, Cleveland, Ohio, has taken a contract to design and superintend the construction of a machine shop, 60 x 140 feet, with office, 30 x 60 feet, on the second floor, for the American Car & Ship Hardware Manufacturing Company, New Castle, Pa.

The Simms Magneto Company, East Orange, N. J., is erecting two additions of concrete and brick, one 42 x 70 feet, for its grinding and dipping department, and the other, 72 x 90 feet, for storage and shipping. The company reports that all necessary equipment for these two additions has been purchased.

The new addition, 112 x 230 feet, one and one-half stories, which the Keeler Brass Works, manufacturer of brass novelties, etc., Grand Rapids, Mich., is erecting, is nearly completed, and among the equipment to be installed are the following: punch presses, automatic screw machines, wire forming machines, wire heading machinery, drill presses, drilling machines, etc.

An entire city block has been acquired by the Cleveland Galvanizing Works Company, Cleveland, Ohio, adjacent to their present location which is in the heart of the city. The acquiring of this property will permit the company to manufacture a line of weldless wire chain, sash chain, and chain of all kinds, to greatly enlarge their present plant and output. The property has a Pennsylvania Railroad Siding and fronts on four streets. Important additions to the company's lines of chains in the last few years has made it practically impossible for them to keep pace with their orders.

The Union Smelting & Refining Company, 14th street and Avenue D, New York, who recently announced that they had taken over, and are operating the plant of the Brooks Solder & Metal Works, Baltimore, Md., state that, though busier than ever, the large capacity of their three plants enables them to handle an enormous amount of business, and they will be glad to receive inquiries for white metal alloys of all kinds, including solder, wire solder, spelter solder, babbitt metal, type metals, lead and tin pipe and white metal sheets.

W. L. Churchill, industrial specialist, Woolworth building, New York, is offering to foundrymen who have had poor success with match plates a new method of overcoming their difficulties. Under this plan a highly competent and experienced man is put right into the foundryman's own plant, and there, right under his eyes, and with the co-operation of his own employees, the match plates are made to suit his particular needs and equipment. The foundryman's own men are taught all the little refinements that mean the difference between success and failure. Under this economical arrangement no time is wasted, the art of making match plates and of making them pay being taught to Mr. Churchill's clients while they are actually producing match plates.

CANADIAN HANSON AND VAN WINKLE COMPANY

The Canadian Hanson & Van Winkle Company, Toronto, Canada, report by R. G. Brice, general manager, that they are now manufacturing in Canada practically their full line of material. They have just finished the erection of a nickel foundry for the production of cast nickel anodes. They also operate a brass, bronze and aluminum foundry. This company has now over 24,000 square feet of floor space, most of which is used for manufacturing and they actually produce buffs of all kinds, polishing wheels, compositions, quite a large variety of chemicals, and they have a well-equipped lacquer factory, wood working factory, machine shop and electrical works.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To manufacture aluminum goods.—The Wadsworth Aluminum Company, Wadsworth, Ohio. Capital stock, $20,000. Incorporators: W. C. Washburn, L. B. Washburn, H. W. Heckman and others.

FOREIGN TRADE OPPORTUNITIES

For addresses of these enquiries apply to Bureau of Foreign and Domestic Commerce, Washington, D. C., and give file numbers.

Copper, No. 19235.—A firm in Greece informs an American consular officer that it desires to communicate with exporters of sulphate of copper with a view to importing same. Quotations should be c. i. f. port of destination. Payments arranged to suit seller. Correspondence may be in English. References given.

Sulphate of Copper, No. 19281.—A report from an American consular officer in Greece states that a firm desires to establish commercial relations with exporters of sulphate of copper, with a view to placing orders at once. Formerly the imports were made in casks of 560 pounds, the usual guaranteed strength being 98 to 99 per cent. pure. Quotations are desired c. i. f. destination. Payment will be arranged to suit seller. There is no import duty on this article.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Monel Metal.—The International Nickel Company, New York, N. Y., has issued a price list which went into effect November 1, for hot rolled Monel metal rods. The base price as shown by this list is 31 cents per pound with a scrap allowance of 18 cents per pound delivered to Bayonne, N. J. The price list also contains useful tables of weights giving the weight per running foot in pounds for rods in various diameters.

Dynamos, Plating Barrels.—The Boissier Electric Company, manufacturers of the famous "World" plating dynamo, who recently moved into their fine new plant at 205 West 19th street, New York, have on the press a new catalog describing their dynamos, their new plating barrels and other equipment for platers and electrotypers. This catalog, "W-1," contains information relative to several new things of interest to all platers, galvanizers and electrotypers, and is sent free on request.

Copper Wire Cloth.—The New Jersey Wire Cloth Company, Trenton, N. J., has issued an eight-page pamphlet giving a very interesting comparison of the differences in the properties of copper and bronze when used for the manufacture of wire cloth. The gist of the argument seems to be that copper, if treated scientifically, is adapted to make a more satisfactory fabric than any alloy made of copper and zinc. The New Jersey Company will be pleased to send copies of this pamphlet No. 1601 on request.

Buffing, Polishing and Burnishing Machinery.—Bulletin No. 700, the latest of the series of publications issued by the Munning-Loeb Company, Matawan, N. J., on electro-plating and polishing equipment and supplies, fully describes the Munning-Loeb line of buffing and polishing lathes from the small bench lathes to the large double spindle pedestal lathe, also belt strapping machines, flexible grinders, tumbling barrels, burnishing barrels and sand blast apparatus. This bulletin will be sent to anyone on request in addition to any of their former publications.

Foundry Supplies.—The J. S. McCormick Company, Pittsburgh, Pa., manufacturers of foundry supplies and equipment, have just issued their new catalog, No. 30, which is a handsomely bound volume of 372 pages, including index. The book contains descriptions and illustrations of practically everything that could possibly be needed in the foundry. There is included in the back of the book a number of tables and other interesting data relating to the analyses of alloys and some mixtures for various kinds of metal. Copies of this catalog may be had upon request.

Dipping Baskets, Wire Work.—John P. Smith & Company, 495 State street, New Haven, Conn., are sending out a series of blotters on which they advertise wire dipping baskets, which they make in all sizes and shapes and in all usual metals, and which have been used very extensively for many years, particularly throughout New England. They also make wire cloth in all meshes up to 10,000 holes to the square inch, in brass, bronze, copper, galvanized and black iron; also tool room partitions, lockers, window guards, brass, iron and bronze grills, etc. In fact, they furnish practically any kind of wire work desired.

Chemical Apparatus.—The Arthur H. Thomas Company, Philadelphia, Pa., has issued a series of leaflets giving illustrations and descriptions of chemical glassware and other laboratory apparatus that they were prepared to furnish to the trade. In view of the difficulty experienced by dealers in obtaining Bohemian and Jena glassware it is interesting to note that glass is now being made in this country that will answer the rigid requirements imposed upon it by the chemists. This glass is known as "Pyrex" and is obtainable in all the various shapes and sizes it formerly came from abroad. "Pyrex" glass is made by the Corning Glass Works. Catalogs and full information may be obtained from Arthur H. Thomas Company.

Boron Products.—The American Boron Products Company, Reading, Pa., are sending out a series of circulars that set forth in detail the uses to which Boron-Copper may advantageously be put. Among other things the circular states that "in making brasses or bronzes, loss of zinc from volatilization is almost wholly prevented if 1% of the copper used is Boron-Copper.

"One to three per cent. of Boron-Copper will produce pure copper castings free from porosity. Five to fifteen per cent. of lead may be introduced into these castings without showing segregation.

"Five per cent. Boron-Copper with 5% ordinary copper and 90% aluminum, produces a very superior aluminum bronze.

"Ten per cent. Boron-Copper with 40% ordinary copper and 50% lead makes a very fine 'plastic bronze' for bearings. This has a tensile strength of 14,000 lbs. per square inch. Different degrees of hardness may be imparted by the addition of small percentage of tin, zinc, manganese copper or phosphor copper.

FIRE

The Bausch & Lomb Optical Company, Rochester, N. Y., under date of November 20, issued the following card to the trade:

"There was a fire in our glass plant yesterday morning, the extent of which was grossly exaggerated in the newspapers. It destroyed a small building of our river bank plant, far removed from the main factory, and in no way interferes with our production. Rebuilding has already commenced and we expect the reconstruction to be completed in about two weeks. Loss is very slight."

It is reported that Joseph P. Day and Douglas L. Elliman & Co. have sold to the Empire Metals Products Company the Cosmopolitan factory at Irvington-on-Hudson, N. Y. This plant was built by John Brisben Walker to be used for the publishing of the *Cosmopolitan Magazine*, and was designed by Stanford White. The factory is an imposing structure, overlooking the Hudson River. The property is said to have cost $300,000, and is considered one of the best factories in Westchester county. It was held for sale at $100,000. The Empire Metals Products Company is going to manufacture a general line of finished brass goods.

NEW METAL ROLLING MILL

The American Cupro-Nickel Company has recently been incorporated under the laws of the State of Delaware, with a capital stock of $1,150,000.

Moritz Thomsen, of Seattle, president of the Centennial Flour Mills, vice-president, First National Bank of Seattle, and owner of large interests on the Pacific Coast and elsewhere, is one of the organizers and president of the corporation.

The company has secured a rolling mill site at Stamford, Conn. Machinery and complete equipment is now arriving on the ground and being rapidly installed, and when completed it will be one of the most complete and modern rolling mills in the country. Work is progressing so rapidly that the officials of the company feel safe in stating that they will be in position to operate the mill by January 15, 1916.

The company has surrounded itself with the most competent metal men to be found in the country and their motto will be, "Quality First." They will make a specialty of rolling cupro-nickel, but will also do a large business in brass and copper products. The sales office is at 120 Broadway, Suite 3002, and orders are now being booked.

INCREASE IN CAPITAL STOCK

The General Aluminum & Brass Manufacturing Company, Detroit, Mich., has increased its capital stock from $400,000 to $600,000.

EXTRA DIVIDEND

Boston advices state that the American Brass Company, Waterbury, Conn., has declared an extra dividend of 5 per cent., payable December 20 to stock of record December 3, bringing the total dividend disbursements for 1915 to 13 per cent.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

New York, December 6, 1915.

COPPER.

It took several weeks for the consumers of copper to make up their minds that the copper market was absolutely controlled by the big producers and that nothing was to be gained by delaying purchases that had to be made for the first two or three months of next year. September and October were very dull months and the stocks being carried by the producers must have been piling up. With the beginning of November the much heralded buying movement commenced and the quicker prices were advanced the more consumers seemed to like it. On November first the price of electrolytic was 18 cents, after some days the price was advanced an eighth, then another eighth, by the fifteenth of the month the price of electrolytic had been advanced to 18¾, three quarters of a cent a pound, later prices were advanced ½ cent per pound from Friday to Monday, and then another ¼ cent, making a full cent a pound advance in a week, consumers were still clamoring for copper, and those that had covered some of the requirements came back for second helps. At the end of the month the producers have transferred a lot of surplus stocks of copper to consumers at around 20 cents a pound and have marketed a good proportion of their output for the next three months at the same fancy price. Mighty good business and everybody's happy, that's the funny part of it. Fancy a man coming to you in the street, putting his hand in your pocket, taking out a good handful of your hard earned cash; he gets away with it and you smile and feel happy—bright man, that! There was a time during the rush when the price was being advanced half a cent a pound at a clip, when some of the producers had that Sanatogen Ad. kind of look, they really were worried, they said they were terribly worried. What do you think it was? The price was 19½, the orders were coming in so fast they had to put the price up to 20 cents—because, oh! they were really worried—they were afraid they would not have enough copper to go around. We felt very badly about it ourselves, it seemed so cruel to rob them of all their copper at 20 cents a pound. If Mr. Ford knew about this he could surely have stopped it.

It is reported around that Germany has bought a lot of copper for delivery after the war. She evidently believes in doing her Xmas shopping early. It is not exactly a bull point on copper. It is not altogether improbable that some of this copper—they are supposed to have bought about 200,000,000 pounds—may come on the market again, so many things may happen meanwhile.

The copper market during the month has been quite active and prices advanced 2 cents per pound. Electrolytic is quoted today at 19¾ to 20 cents, Lake 19¾ to 20 cents and casting 19¼ to 19½.

TIN.

The tin market had a bad scare when the Suez Canal was reported closed, prices ran up about 3 cents per pound to 44½ cents and then down again to 39½ and closed at around 40 cents.

LEAD.

The price of lead has been advanced $7.00 per ton during November, from $4.90 to $5.25 New York basis at the close. The market is quite firm at the advance and the independent sellers are not anxious to cut prices. The New York market is quoted at $5.25 and East St. Louis $5.17½ to $5.22½ for future deliveries.

SPELTER.

The spelter market has been quite active and prices have advanced over 4 cents per pound from 14.70 cents at the opening to 18.85, the high point. At the close the market is rather easier and prices are about ¼ cent per pound below the highest.

ANTIMONY.

Antimony prices are higher again and the market for a time was very active. Chinese and Japanese advanced nearly 5 cents per pound, from 34½ at the opening to 40 cents at the close. Chinese-Japanese is quoted today at 40 cents and American at 39¾ to 40 cents.

ALUMINUM.

The aluminum market has been fairly active and prices have advanced about 3 cents per pound. No. 1 Virgin has advanced from 56 to 59 cents and No. 12 alloy from 46 to 50 cents.

QUICKSILVER.

The price of quicksilver has advanced $15.00 per flask. From $95.00, the wholesale price at the opening, to $110 at the close. The advance is due to scarcity of supplies owing to shipments having been delayed.

SILVER.

The silver market has followed the advances in all other metals and prices today are over 3 cents per ounce higher than at the opening. New York is quoted 56⅜, with London at 27¼d.

PLATINUM.

Platinum is very scarce owing to the embargo and the stock here is pretty well controlled. It is only possible to get hold of small lots, and for these consumers have to pay fancy prices. The white alloy is nominal at around $67.00 per ounce, soft refined $70.00 per ounce and the 10% hard at about $74.00.

SHEET METALS.

Sheet copper, wire and all brass products have been advanced owing to the advances in the base metals. Sheet copper is quoted at 25 cents, copper wire at 21 cents and high sheet brass at 27¼ cents.

OLD METALS.

The old metal market has been quite active owing to the steady advance in all ingot metals and the turnover during the month has been very satisfactory. There is a fair export demand and prices are from 1 to 2 cents per pound higher.

NOVEMBER MOVEMENTS IN METALS

	Highest.	Lowest.	Closing.
Copper,			
Lake	20.00	18.00	19.75
Electrolytic	20.00	18.00	19.75
Casing	19.25	17.35	19.25
Tin	44.50	36.25	39.80
Lead	5.25	4.90	5.25
Spelter	19.00	14.30	18.25
Antimony (Chinese and Jap)	40.00	35.50	40.00
Silver	56½	49¼	56⅜

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

1913—Average for year, 15.83. 1914—Average for year, 13.91. 1915—January, 14⅛. February, 15.25. March, 15.75. April, 18.50. May, 22.50. June, 22.50. July, 22.25. August, 19.50. September, 18.50. October, 18.25. November, 19⅜.

Brass Mill Spelter. 1915—January, 6.55. February, 11.85. March, 12.15. April, 13.85. May, 20.55. June, 25.60. July, 24.90. August, 19.30. September, 17.85. October, 16.85. November, 19.36.

Metal Prices, December 6, 1915

NEW METALS.	Price per lb. Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	19.75
Electrolytic, carload lots	19.75
Casting, carload lots	19.25
TIN—Duty Free.	
Straits of Malacca, carload lots	39.75
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	5.25
SPELTER—Duty 15%.	
Brass Special	19.25
Prime Western, carload lots, nominal	18.25
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	70.00
100 lb. lots, f. o. b. factory	65.00
Ton lots, f. o. b. factory	60.00
ANTIMONY—Duty 10 per centum.	
Cookson's cask lots, nominal	....
Hallett's cask lots, nominal	....
Hungarian grade	39.75 to 40.00
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad. valorem.	
Shot, Plaquettes, Ingots. Blocks	45.00
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	6.00
BISMUTH—Duty free	nominal
CADMIUM—Duty free	nominal 1.90
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	2.00
QUICKSILVER—Duty, 10% per flask of 75 pounds	125.00
GOLD—Duty free	$20.67
PLATINUM—Duty free	$70.00 to 80.00
SILVER—Government assay—Duty free	56¼

INGOT METALS.	Price per lb. Cents.
Silicon Copper, 10% according to quantity	30 to 32
Silicon Copper, 20% " "	33 to 35
Silicon Copper, 30% guaranteed " "	36 to 40
Phosphor Copper, guaranteed 15% " "	28 to 32
Phosphor Copper, guaranteed 10% " "	26 to 30
Manganese Copper, 30%, 2% Iron " "	27 to 31
Phosphor Tin, guaranteed 5% " "	58 to 61
Phosphor Tin, no guarantee " "	44 to 47
Brass Ingot, Yellow " "	13 to 16½
Brass Ingot, Red " "	15 to 16½
Bronze Ingot " "	18½ to 19½
Manganese Bronze Ingots " "	24 to 25
Phosphor Bronze " "	18 to 19½
Casting Aluminum Alloys " "	45 to 50

PHOSPHORUS—Duty free.	
According to quantity	35 to 40

Dealers' Buying Prices. Cents per lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
16.50 to 17.00	Heavy Cut Copper	18.00 to 18.50
16.00 to 16.50	Copper Wire	17.50 to 18.00
14.00 to 14.50	Light Copper	16.00 to 16.50
13.00 to 13.50	Heavy Mach. Comp.	15.00 to 15.25
11.00 to 11.50	Heavy Brass	12.50 to 13.00
9.00 to 9.50	Light Brass	10.50 to 11.00
11.50 to 12.00	No. 1 Yellow Brass Turnings	13.00 to 13.50
11.50 to 12.50	No. 1 Comp. Turnings	13.00 to 14.00
4.00 to	Heavy Lead	.... to 4.25
10.00 to	Zinc Scrap	.... to 11.00
15.00 to 20.00	Scrap Aluminum Turnings	20.00 to 24.00
25.00 to 30.00	Scrap Aluminum, cast alloyed	30.00 to 35.00
30.00 to 35.00	Scrap Aluminum, sheet (new)	35.00 to 40.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 26.00	Old Nickel	20.00 to 26.00
18.00 to 20.00	Old Nickel anodes	18.00 to 20.00

PRICES OF SHEET COPPER.

BASE PRICE, 25 Cents per Lb. Net.

Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
	SIZE OF SHEETS.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Net longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Not longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 8c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC—Duty, sheet, 15%.	Cents per lb.
Carload lots, standard sizes and gauges, at mill.....22 cent basis, less 8%	
Casks, jobbers' prices	22½
Open casks, jobbers' prices	23

Metal Prices, December 6, 1915

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect July 2, 1915

To customers who buy over 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.26⅝	$0.26½	$0.26⅞
Wire	.26⅜	.27	.27⅝
Rod	.26⅝	.27	.27⅞
Brazed tubing	.30⅜	—	.33½
Open seam tubing	.30¾	—	.33½
Angles and channels	.30⅜	—	.33½

To customers who buy 5,000 lbs. or less per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.28⅛	$0.28½	$0.28⅝
Wire	.28½	.29	.29⅝
Rod	.28⅝	.29	.30
Brazed tubing	.32¼	—	.35½
Open seam tubing	.32¼	—	.35½
Angles and channels	.32¼	—	.35½

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

21c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order.....24c. per lb. base
100 lbs. to 300 lbs. in one order.....24½c. " " "
Less than 100 lbs. in one order.....26c. " " "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, — per lb.
Seamless Copper Tubing, — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛ ¼ ⅜ ½ ¾ 1 1¼ 1½ 2 2½ 3 3½ 4 4½ 5 6

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet	
	Brass.	Bronze.
⅜ inch		
½ inch		
⅝ inch		
¾ inch		
⅞ inch		
1 inch		
1¼ inch		
1¼ inch		
1½ inch		
1¾ inch		
2 inch		

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Red .....34c. net base
Muntz or Yellow Metal Sheathing (14" x 48").....30½c. " "
" " " " Rectangular sheets other than Sheathing.32c. " "
" " " " Rod .....30½c. " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 38½c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 4c. over Pig Tin. 50 to 100 lbs. 5c. over, 25 to 50 lbs. 7c. over, less 25 lbs. 9c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Gauge.	Width. Inches.	1 ton.	50 to 2,000 lbs.	Less than 50 lbs.
20 and heavier	3-30			
	3-30			
21 to 24 inclusive	30-48			
	48-60			
25 to 26	3-30			
	30-48			
27	3-30			
	30-48			
28	3-30			
	30-48			
29	3-30			
	30-48			
30	3-30			

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters.

Stubs' Gauge. Inches.	⅛ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11. .120.																	
12. .109.																	
14. .083.																	
16. .065.																	
18. .049.																	
20. .035.																	
21. .032.																	
22. .028.																	
24. .022.																	

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

We are unable to quote these prices.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	34c.	16%	38c.
8%	35½c.	18%	38½c.
10%	36c.	20%	41c.
12%	37c.	25%	49c.
15%	37½c.	30%	54c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%	36c.	15%	42¾c.
8%	38c.	16%	43¼c.
10%	39¼c.	18%	45¼c.
12%	41¼c.	30%	60½c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.

Chemical Lib. PERIODICAL ROOM RECEIVED

INDEX NUMBER

DEC 7 0 1915
UNIV. OF MICH. LIBRARY

VOL. 13. NO. 12 Registered in U. S. Patent Office DECEMBER, 1915

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED

THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:

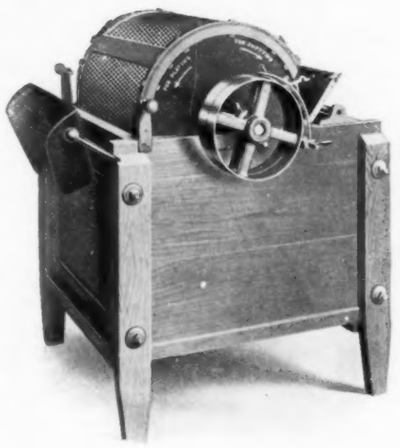
ELECTRO-PLATERS REVIEW.

$1.00 Per Year 99 JOHN STREET, NEW YORK 10 Cents Per Copy

A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES

8 REASONS

WHY YOU SHOULD USE THIS PLATING BARREL



READY TO FILL

1: The plated material is automatically emptied. It is not necessary to hoist the barrel out of the tank to fill or empty.

2: The barrel is entirely constructed of a non-absorbing, non-conducting material. There is no loss of current in this barrel, due to short-circuiting across the heads which occurs in a barrel with wooden heads.

3: The material of which the barrel is constructed is practically indestructible. This means long life for the barrel and small repairs.

4: No stuffing boxes to leak.

5: No gears, shafts, nor bearings immersed in the plating solution.

6: The cathode contact points are fixed and rigid. This prevents loss of current due to contact points clogging or getting dirty.

7: Cathode contact points are made of a high conducting material which will not plate.

8: Tank is placed on legs. This insures ventilation under the tank and prevents it from rotting.

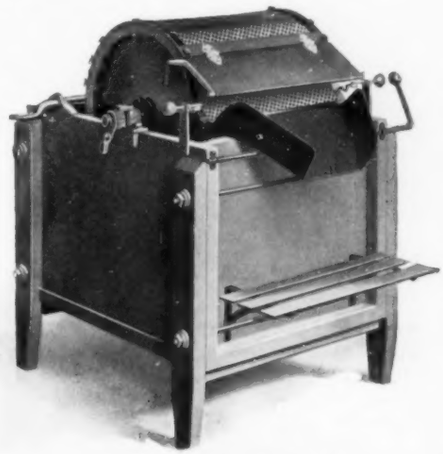
The U. S. Junior

Is as good as it looks. The high class of work it produces is the pride of every plater who uses it. Its features of economy appeal to the superintendent and manager. It will pay you to investigate this apparatus.

SEND FOR BULLETIN NO. 100

U.S. Electro Galvanizing Co.

5 PARK AVE. BROOKLYN, N. Y.



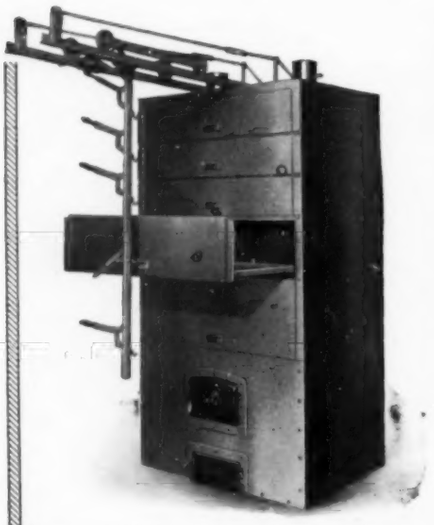
READY TO EMPTY

Contents, Page 508. Directories, Page 40. Want Ads, Page 46. Index to Advertisements, Page 39

STRICTLY FOR
Rolling Mills
Ingot Metals
Brass and Aluminum
Foundries
Smelters and Refiners

Stirring Times

Export business still rushing. Domestic business booming! A two-billion corn crop; wh
oats, barley, rye and hay beat all records and add 5½ billions to our national wealth. U
Sam to spend billions on defense work!

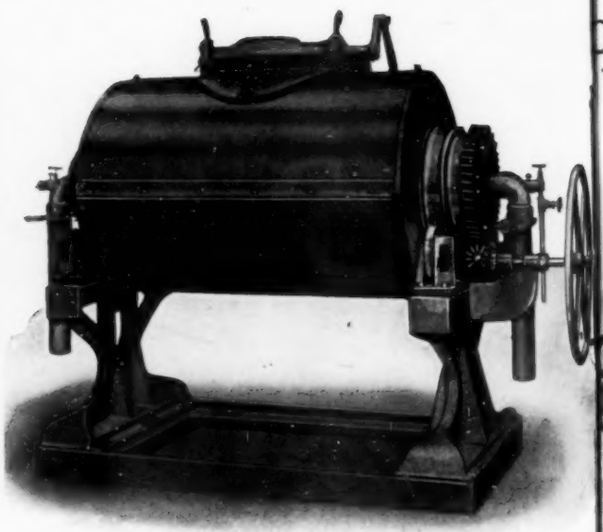


MONARCH-ACME DOUBLE OVERHEAD TROLLEY CORE OVEN. COKE. ANY SIZE. FOR ALL FUELS

FOUNDRYMEN AND MANUFACTURER
GET READY TO DO YOUR PART

We build all types of MELTING FURNACES approved the best authorities. We have the ONLY COMPLET LINE, using all fuels, Oil, Gas, Coal, Coke. We shall contin to give you the Right Furnace in the Right Place, just as have been doing for the world's leading foundries for ma a day.

YOU WILL NEED MONARCH



MONARCH REVERBERATORY SCRAP MELTING FURNACE

Oil, Gas, Coal, Coke

For melting large material **without reducing to crucible size,** large charge openings and counterbalance weight doors. Capacities 500 to 7500 pounds **per heat.** Built Stationary and Tilting. As the metal is drawn from the bottom of the chamber, the impurities, such as slag, remain at top and may be removed by skimming, or drawn off with last heat. Especially adapted for **Dross of Tin and Zinc and Borings.** Very low in fuel consumption. Send for "Series 31."

THE PATENTED "SIMPLEX" SINGLE CHAMB NON-CRUCIBLE FURNACE

Is for Oil or Gas and Air, Soft Blast, Air 8 ounces

This is a reasonably priced article to operate, giving you large melting put. Very popular, and installed in batteries in leading plants, showin quality of metal equal to that melted in crucibles, but in larger quantities less melting time. So easy to start off! Easily lined and kept in repair. for Series 28.

No. 92— 500 lbs. Brass per heat.....8 heats per
No. 93—1000 lbs. Brass per heat.....6 heats per
No. 94—2000 lbs. Brass per heat.....5 heats per

We have the Furnace for You. Get Your Order In At Once **Ask for Catalog "TMI 4/1913"** **Write, Wire or Phone Your Inqui**

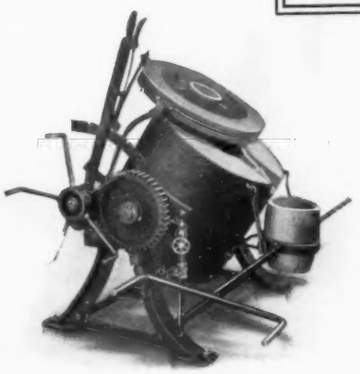
THE MONARCH ENGINEERING AND MFG. C

1206 AMERICAN BUILDING, - - - - - - - BALTIMORE, MD., U. S.

Ahead of U.S.

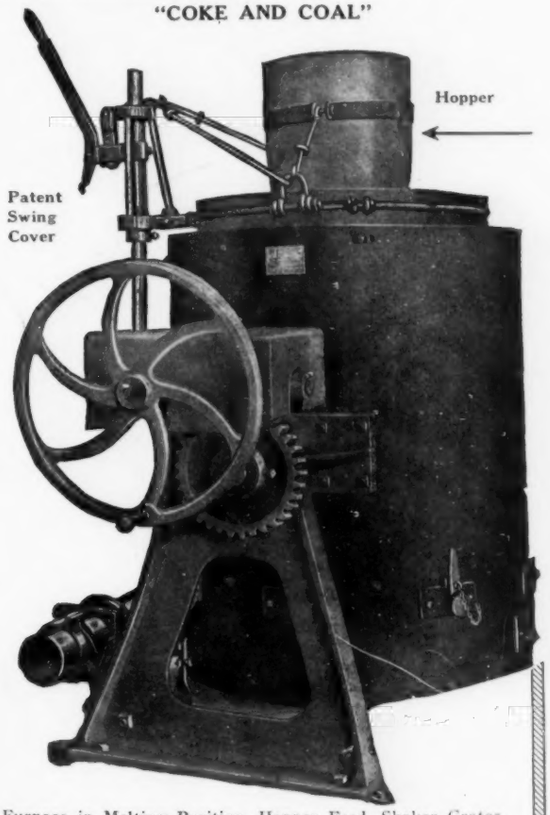
BRANDS
Monarch
Steele-Harvey
Monarch-Rockwell
Simplex
Double-Chamber

Tilting, Oil and Gas
Enclosed Combustion Chamber
"Monarch" Furnace



Tilting, Oil and Air
Open Flame
"Steele-Harvey" Furnace

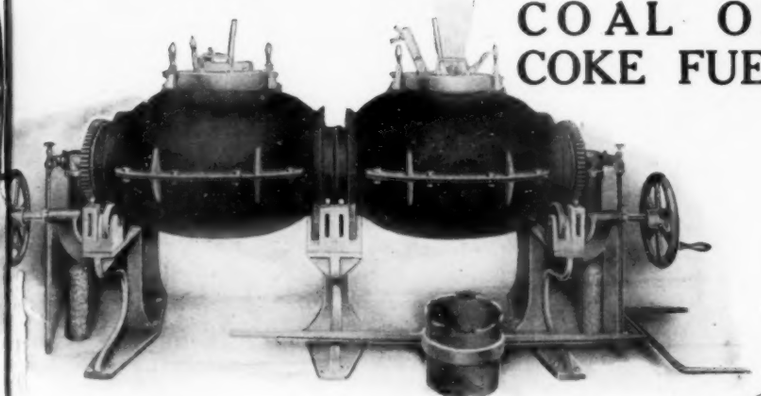
"COKE AND COAL"



Furnace in Melting Position, Hopper Feed, Shaker Grates

FURNACES

OR MELTING ALL METALS, WITH OR WITHOUT CRUCIBLES, AND USING OIL, GAS COAL OR COKE FUEL



Double Chamber Melting Furnace—Oil and Gas

MONARCH TILTING AND STATIONARY CRUCIBLE FURNACES
OIL, GAS, COAL AND COKE

All operating **above ground**

Crucibles from No. 20 to No. 600. From 60 to 1600 lbs. metal per heat. Very low air, 2 oz. up to 1 pound. Fuel, very low consumption. Yours on trial of 10 days. A practical furnace for output and economy.

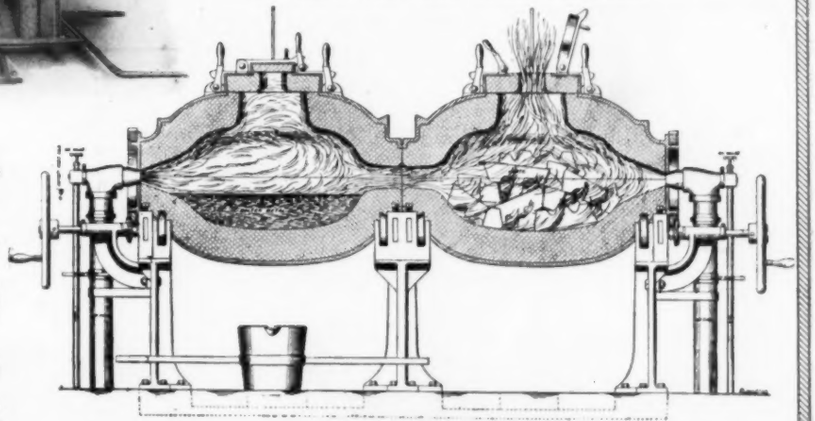
Built like the Government—**nothing better.** There is not a spot where a "Monarch" is not operating. Say the word, give us a line on your needs. Catalog will explain.

HE PATENTED "MONARCH-ROCKWELL" OUBLE CHAMBER FURNACE (Oil or Gas)

Using each chamber alternately or together, melting one or two sses of metals at same time, burners working alternately. The e does not impinge on metal, but heats by radiation, as it dif- s itself in vacuum zone above metal line. THEREFORE, the loss of the lowest possible minimum, as the flame is so soft (only 8 0 oz., by fan blast) that the volatile metals are only added when alloys are ready to pour.

We have the **only successful** non-crucible furnace and will fur- statistics and references to prove it. Both chambers working ame time under one burner. Send for Series 33.

mber 1—Capacity Brass per heat, 500 lbs.....8 heats per day
mber 2—Capacity Brass per heat, 1000 lbs.....7 heats per day
mber 3—Capacity Brass per heat, 2000 lbs.....6 heats per day
mber 4—Capacity Brass per heat, 4000 lbs.....4 heats per day



ACTION OF HEAT
Double Chamber Melting Furnace—Oil and Gas

You'll save a lot of time and money when cleaning your castings, if you use

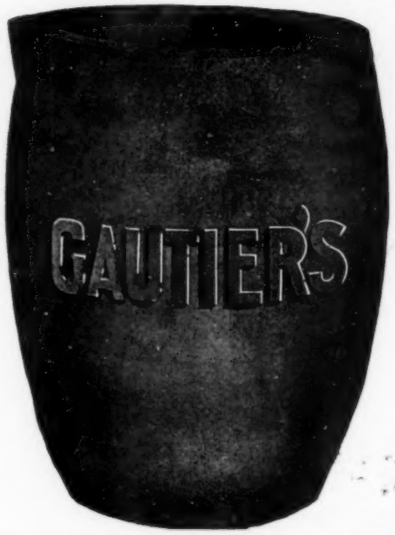
DIXON'S GRAPHITE FOUNDRY FACINGS

They consist of proper mixtures of Dixon's Graphite and come in various combinations for light, medium and heavy castings, and for either green sand or dry sand. The use of these facings gives smooth, easily cleaned castings of the right color and texture. Send for booklet "Dixon's Foundry Facings," No. 12-S.

JOSEPH DIXON CRUCIBLE COMPANY

Jersey City, N. J.
Established 1827 S-7

THE STANDARD IN CRUCIBLES



MANUFACTURED FOR OVER 50 YEARS

J. H. GAUTIER & CO., JERSEY CITY, N.J.

CLAY-LINED CRUCIBLES

Are more in demand every day. We have made a special study of their making and requirements. Results—ours are the very best made. Write for prices. Send us your next order.

McCullough - Dalzell Crucible Co.
PITTSBURGH, PA.

USE ONLY THE CHAS. K. SCHWEIZER CO.
MOULDS
Waterback and Plain
214 Vine St., ST. LOUIS, MO.

SOLDER, BABBITT, LINOTYPE, TIN AND LEAD MOULDS.

Send your inquiries on special designs.

PHOSPHORUS
For Phosphor-Bronze, Copper, Tin, Etc.
GENERAL CHEMICAL CO. 712 Lafayette Building PHILADELPHIA, PA.

NOTICE TURKEY BOXWOOD SAWDUST and Other Kinds, for Silver and Nickel Platers and Brass Goods Manufacturers
JOHN SOMMER FAUCET CO., 355 Central Ave., Newark, N.J.

KALYE

(Trade Mark)

FOR PREPARING METAL SURFACES FOR PLATING, &c.
SAMPLE CAN SENT FREE

Correspondence Solicited. Mention this Journal

H. M. ANTHONY CO., Agent, 261 Greenwich St., New York

An Efficient Non-conductor of Heat (1)
Strong in Structure (2)
Convenient in Form (3)
Moderate in Cost (4)

These four qualities are necessary in any material which is to be used for protecting furnaces, ovens, boiler settings, etc., from loss of heat by radiation. Without them (1) an excessive thickness of insulation will be necessary; (2) the material will crumble under the loads ordinarily encountered; (3) it will be hard to handle and expensive to install; (4) a large outlay of money will be required and the return on the investment will be small.

Nonpareil Insulating Brick
for Furnaces, Ovens, Boiler Settings, etc.

meet all of these requirements in a remarkable degree:

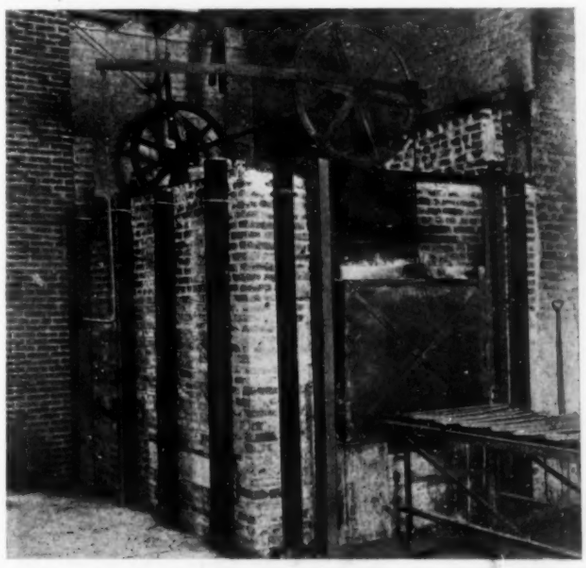
(1) They are ten times more efficient heat insulators than fire brick or red brick. One 4½-inch course of Nonpareil Brick is equal to 45 inches of fire brick in the retention of heat.

(2) Their structural strength is sufficient to withstand loads up to 140 pounds per square inch—20,160 pounds per square foot. This is sufficient for all ordinary conditions.

(3) The convenient form of Nonpareil Brick makes them easy to handle and install. They are the same size as fire brick, 9 x 4½ x 2½ inches, and are readily bonded with the other brick, giving a much stronger construction than is possible with loose materials.

(4) Nonpareil Insulating Brick are moderate in cost and, in most cases, the fuel saved by using them will pay for their installation in less than a year. They usually yield 100% on the investment.

Full information regarding Nonpareil Insulating Brick is given in the booklets, "Good Furnaces Made Better" and "Saving Fuel."



Enameling furnace insulated throughout with Nonpareil Insulating Brick. Maryland Enamel & Sign Co., Highlandtown, Md.

Send for them and a sample brick

Armstrong Cork & Insulation Co. 116 Twenty-fourth Street PITTSBURGH, PA.

Also manufacturers of Nonpareil High Pressure Covering for steam lines, feed water heaters, etc., and Nonpareil Cork Covering for drinking water systems.

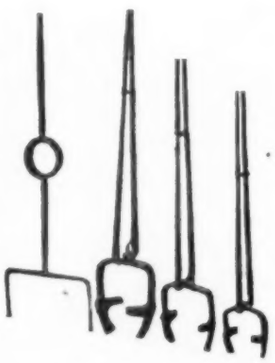
OUR catalogue is made up of bulletins devoted to various subjects, in connection with

Foundry Equipment

and we would like you to have them either separately or collectively in a binder. Will you write us?

J. W. Paxson Co., Mfrs.

1021 No. Delaware Ave. Philadelphia, Pa.

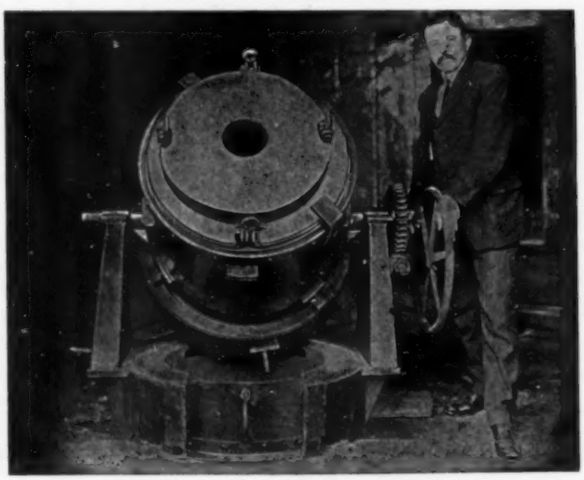


FOUNDERS!

AN "IDEAL" COKE FIRED CRUCIBLE FURNACE

placed in competition with any or all other makes of Brass Melting Furnaces, will demonstrate that the "IDEAL" is the one for you to install.

We invite a competitive trial.

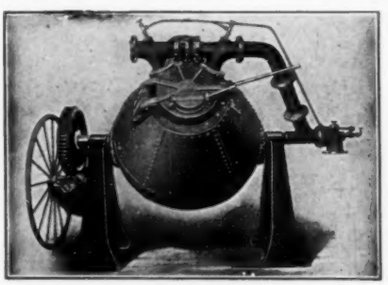


No. 125 and No. 150 Furnaces are all above the floor and have drop grate.

SEND FOR CATALOG AND NEW PRICE LIST

IDEAL FURNACE CO., Chester, Penna.

Hawley-Schwartz Furnaces



No. 2, 42" Cauldron

Extract from a letter from one of the largest Foundries in the United States:

"We are always glad to do anything we can to change the erroneous impression that a number of small brass foundries have that the best way to get a high grade metal is by means of melting a number of small charges in separate crucibles and mixing them in a ladle. We do not have any crucible equipment in our plant at this time, and do not propose to install any, having discarded our entire crucible outfit in favor of the Hawley-Schwartz Furnaces."

(Name given on application.)

The Hawley Down Draft Furnace Co.

Easton, Penn., U. S. A.

The Brand of Quality

ROSS-TACONY CRUCIBLE CO.

(Size Number)

TACONY PHILADELPHIA, PA.

NEW YORK OFFICE
Fifth Avenue Building

CHICAGO OFFICE
Central Steel & Supply Co.,
Railway Exchange Bldg.

Absolutely Uniform Annealing

is being obtained by users of

QUIGLEY ACCURATE TEMPERATURE FURNACES for Brass, Copper, Steel, Etc.

One of our standard rolling mill furnaces being used for annealing brass cartridge cases

QUIGLEY FURNACE & FOUNDRY CO.

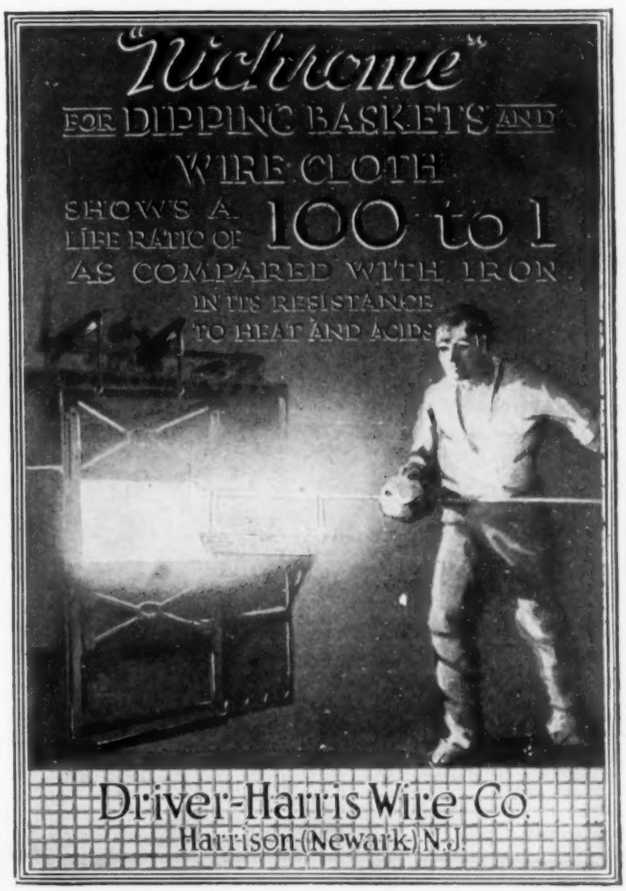
ENGINEERS AND CONTRACTORS

Builders of Powdered Coal, Oil and Gas Burning Furnace Equipment

Sales and Engineering Offices

105 WEST 40th ST., NEW YORK CITY

Canadian Agents: The W. W. Butler Co., Ltd., Montreal


"Nichrome"
FOR DIPPING BASKETS AND WIRE CLOTH
SHOWS A LIFE RATIO OF 100 to 1
AS COMPARED WITH IRON
IN ITS RESISTANCE TO HEAT AND ACIDS

Driver-Harris Wire Co.

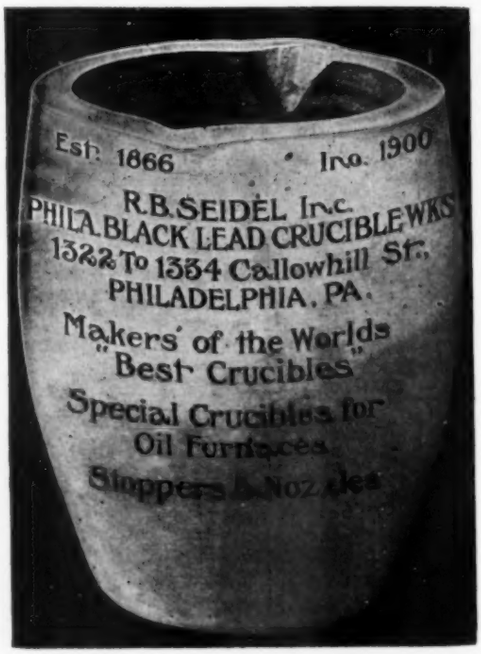
Harrison (Newark) N.J.

TAYLOR CRUCIBLES

For Years the Recognized
Standard
for Uniform Service

IF INTERESTED, WRITE US

ROBERT J. TAYLOR, Incorporated
1900 to 1916 Callowhill Street, PHILADELPHIA, PA.



CRUCIBLES
OF QUALITY

JONATHAN BARTLEY CRUCIBLE CO.
Trenton, N. J., U. S. A.

Boron-Copper and Boron-Copper Plastics

(Patented in the leading countries of the world)

TO WHOM IT MAY CONCERN:

BORON-COPPER is pure copper treated with Boron gas (while the copper is molten), in such a manner that the gas is occluded by the copper and crystallized throughout the mass upon cooling.

This treated copper then becomes a flux, or deoxidizer, and when small percentages of it are added to other metals, or combinations of metals, has the property of cleansing them from oxids and causing a mixing, or stirring of the whole melt. A cleaner pouring metal or a more homogeneous alloy is the result. It is only necessary to use from 1 to 5% of BORON-COPPER to produce the results mentioned.

In making Brasses or Bronzes, loss of zinc from volatilization is almost wholly prevented if 1% of the copper used is BORON-COPPER.

One to three per cent. of BORON-COPPER will produce pure copper castings free from porosity. Five to fifteen per cent. of lead may be introduced into these castings without showing segregation.

Five per cent. BORON-COPPER with 5% ordinary copper and 90% Aluminum, produces a very superior Aluminum Bronze.

Ten per cent. BORON-COPPER with 40% ordinary copper and 50% lead makes a very fine "Plastic bronze" for bearings. This has a tensile strength of 14,000 lbs. per square inch. Different degrees of hardness may be imparted by the addition of small percentage of Tin, Zinc, Manganese copper, Phosphor copper or any of the hardeners.

Ten per cent. BORON-COPPER and 10% ordinary copper with 80% lead may be rolled into sheet of any thickness from which gaskets for super-heated steam works can be made. The melting point of this is about 900 degs. F.

In making Nickel-Steel one-half the Nickel content may be replaced by BORON-COPPER. The result is a considerable increase in tensile strength and a lowering of cost; BORON-COPPER costing less than Nickel.

The price of BORON-COPPER is 50 cts. per lb. (list price), less 20% and over, according to quantity ordered.

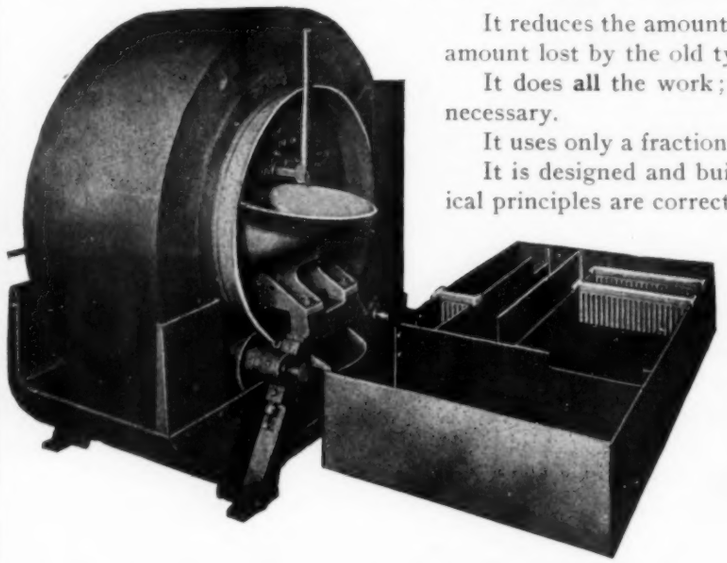
BORON-COPPER IS THE CHEAPEST AND BEST DEOXIDIZER KNOWN TO THE METAL WORLD.

AMERICAN BORON PRODUCTS COMPANY, Inc.

READING, PENNA.

Stop Wasting Power

The new "Standard" Crusher and Pulverizer requires only 3 H. P. as compared with 15 to 20 horsepower it takes to operate the old type crusher of same capacity.



It reduces the amount of metal lost in the tailings to one-half the amount lost by the old type machines.

It does **all** the work; no hand sifting, washing or separating is necessary.

It uses only a fraction of the amount of water other crushers use.

It is designed and built by engineers, not amateurs, its mechanical principles are correct; it is strong and safe.

We fully guarantee the **STANDARD** in every respect, and to enable you to prove these claims for yourself, we offer to ship to reliable firms on approval for 10 days.

Write for **Catalog "SC"** and further information.

The Standard Equipment Co.
New Haven, Conn.

Whiting Turntables

Rigid, self-contained construction. No tipping, no getting out of line, no journal friction. Load is carried on conical chilled rollers, running on machined path. Give long life and smooth, easy operation. **One of the largest railroads has about one thousand Whiting turntables in service.** Send for catalog and prices.

Complete Foundry Equipments.
Cranes of all Kinds.

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U. S. A.
CHICAGO SUBURB.

THE COST OF FUEL

is not so important as what you can get out of it. This depends upon proper utilization which in turn is governed by your furnace design and operation.

If you are confronted with any furnace or fuel problem, our **"Temperature Chart" No. 88-B** may be of assistance to you.

W. S. Rockwell Company
Furnace Engineers and Contractors
50 Church Street **New York**

PHIPPS'
82.31% CARBON BY U.S. GOV'T TEST
HARDWOOD CHARCOAL

Has Greatest Heating and Purifying Value

For BRASS, BRONZE AND ALUMINUM FOUNDERS, SHEET-METAL WORK, Etc.

Charcoal in **Lump, Granulated** and **Pulverized** form for every use and in any quantity

Our Direct-from-the-Mill prices will make you glad "A Bag or a Carlot." Write direct to the manufacturers

PHIPPS CHARCOAL CO., 100 Mill St., IRONTON, O.

Reduce Your Molding Costs
Increase Your Foundry Production

We have a new proposition to make you. Perhaps you have tried and been disappointed with aluminum match plates, yet you undoubtedly know of cases where correctly designed and accurately made cast aluminum match plates pay.

We have no match plates to sell, but we go into your own plant and make them for you to fit your special needs and equipment.

We fit you up right and teach your own men proved methods, and develop your own people in all the little refinements of their successful manufacture and use, thus assuring you of uninterrupted savings in cost and continuous increase of production.

Under this plan, while we are making the patterns you are learning the art.

The proposition is well worth investigating. Write for further enlightenment.

W. L. Churchill, Industrial Specialist
Woolworth Building, New York
Lincoln Electric Bldg., St. Catharine's, Ont.

RADIOCLARITE

for use in melting

Bronze and Brass

C. M. Miller.

is not only a Flux, but it is an amalgamator. It has every quality you are looking for. It saves Crucibles greatly and keeps them clean. It keeps Furnaces clean. **RADIOCLARITE has the record of everything known to Bronze; that is, cleanliness, purity, color, toughness and great strength when required.** The great latent heat in this Flux has a tendency to melt Brass in one-third less time and at a lower temperature, with greater fluidity. Our Flux can meet and take care of all cases. Can pour as thin as tin plate, if necessary. There is not a point this **RADIOCLARITE** does not make for Brass, Bronze and all nonferrous metals.

We send this **Radioclarite** out for trial "**subject to satisfaction or no pay,**" so don't wait for correspondence, send now. You are to be the judge, jury and executioner, if necessary. Ninety per cent. of the automobile trade and half the railroad mileage is using this Flux. Keep in the procession of the Progressive Foundries by sending for our Flux now.

We also make Fluxes for Grey Iron, Semi-Steel, Steel and all ferrous metals. We would be glad to send you a trial order of any of them. Remember, ***we ask no pay for any of our Fluxes unless they suit after trial.***

THE BASIC MINERAL CO.
Box 276, N. S. **Pittsburgh, Pa.**

High Grade Foundry Sand

For Brass, Aluminum, Grey Iron, Malleable, Hardware and Stove Plate

CASTINGS

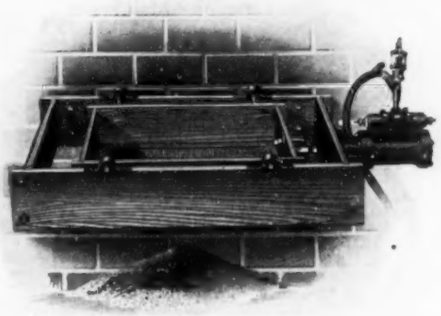
Investigate Our Sand Blast Sand
Order Your Winter Sand Early

Write for Free Sample and Prices

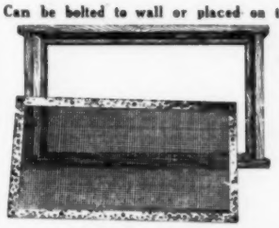
THE NEWPORT SAND BANK CO., Inc.
Geo. W. Dye, Pres. NEWPORT, KY., U. S. A. Est. 1884

New Midget Sand Sifter

FOR BRASS FOUNDRIES



Can be bolted to wall or placed on tub. Light weight. Occupies little room.



One man with a MIDGET will keep six molders busy. Low up-keep cost. Pneumatic drive, dust proof. Costs one-third the price of electrically-driven machines and you avoid the necessity of using small electric motors which no manufacturer guarantees.

Size of Screen, 16x18 in.
Total weight, 80 lbs.

Ask for "New Midget" Circular and Prices.

BATTLE CREEK SAND SIFTER CO.
BATTLE CREEK - - MICH.

Patented

"WILLEY"

ELECTRIC DRILLS MAKE DRILLING A PLEASURE

Send for Catalog

JAS. CLARK, Jr., ELEC. CO., INC.
512 West Main St. Louisville, Ky.

MOTT
SAND-BLAST MFG. CO. INC
MACHINES - ALL TYPES
INSTALLATIONS DESIGNED
CHICAGO NEW YORK
245 CLINTON ST. 1157 E. 138 TH ST.

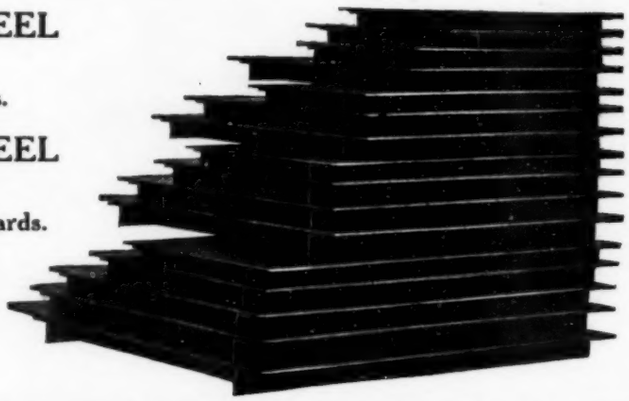
TWO NEW WADSWORTH IMPROVEMENTS

"NEVER BREAK" ALL STEEL CORE TRAYS

For the prevention of crooked cores.

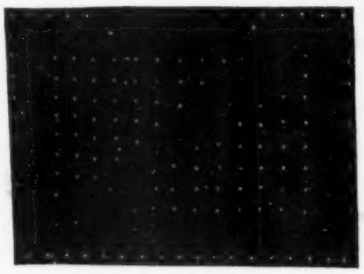
"NEVER BREAK" ALL STEEL BOTTOM PLATES

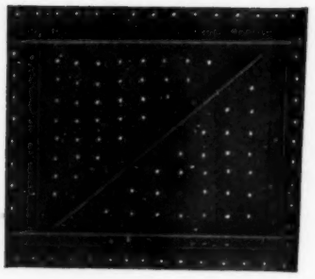
For the prevention of Burnt Bottom Boards.



They are reinforced, unbreakable, absolutely straight, cheaper than cast iron and only one-third the weight.

30 STANDARD SIZES OF EACH CARRIED IN STOCK.
SPECIAL SIZES TO ORDER

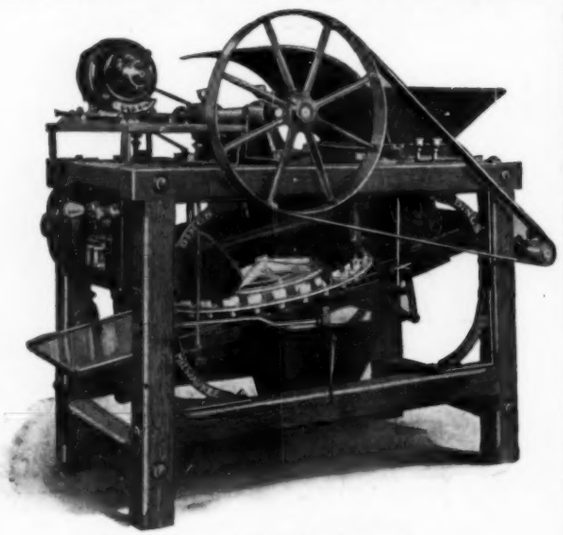




Send for "Never Break" Circular

THE WADSWORTH CORE MACHINE & EQUIPMENT CO.
AKRON, OHIO

MAGNETIC SEPARATORS



No. 2 Type "M" With Generator

Different Types, Sizes and Modifications to meet every requirement for which Magnets and Magnetic Separators are available.

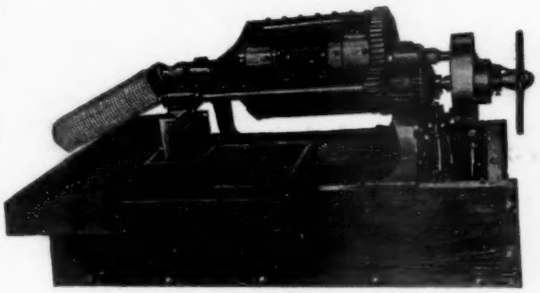
DINGS ELECTRO-MAGNETIC SEPARATOR CO.
MILWAUKEE, WIS.

COLEMAN Sprue Cutter

Most Powerful Brass Foundry Cutter Made

Brass Furnaces
The Cover that Swings

THE COLEMAN FOUNDRY EQUIPMENT CO.
Foundry Engineers Cleveland Ohio



Sly Cinder Mill.

Just The Thing

for small work of all kinds

The Sly No. 5 Baby Sand Blast

Requires about ¼ H. P.

Furnished with Sly design nozzle, in which there is practically no change in air consumption even after long use.

Dust is automatically removed into dust arrester, and sand is automatically used over and over again until worn out.

Very substantially built. Dust-proof roller bearings.
Send for catalog "M."

Save Your Brass From The Cinder Dump

Sly's Brass Cinder Mill has proved its value in hundreds of non-ferrous foundries in the savings of brass that would otherwise go to cinder dump.

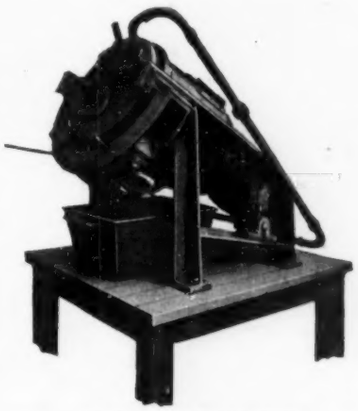
The cinder is ground and washed at the same time and the dirt floated out on the stream of water forced through the mill under pressure from the pump attachment.

The brass recovered will soon pay the cost of the installation. Try this Mill.

"Sly and Satisfaction" go together

THE W. W. SLY MANUFACTURING CO., Cleveland, O.

Designers and Builders of Foundry Equipment With an Established Reputation.
Exhaust Cleaning Mills Dust Arresters Resin Mills

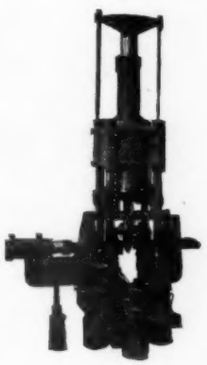


Sly No. 5 Baby Sand Blast.

R. D. WOOD & CO.

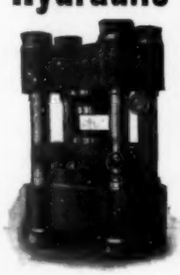
PHILADELPHIA, PA.

High Pressure Valves
Hydraulic Presses
Draw Benches
Accumulators



Hydraulic Machinery and Tools

All Kinds All Sizes Best Quality



Accumulators, intensifiers.
Pumps, hand or power.
Punches, beam, rail, rail bond, screw.
Riveters, portable.
Shears, lever, hand, power.
Valves, operating, check, float, flushing, regulating.
Gauges.
Packings, leather, hemp.
Fittings, nipples, couplings, flexible tubing, pipe.
Presses, die, arbor, punch, drawing, bending, broaching, embossing, flanging, forcing, forging, riveting.
Scrap baling presses.
Jacks, ball bearing, bridge, car, pit, wrecking, traversing.

Write for catalogs, quotations and the advice of our engineers. We will gladly co-operate with you.

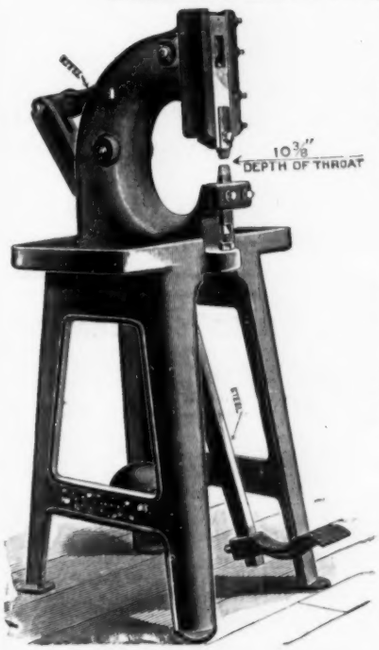
W·S HYDRAULIC

THE WATSON-STILLMAN CO.
Engineers and Builders of Hydraulic Tools
196 Fulton St. New York

W·S HYDRAULIC

TURNER MACHINE CO.

3632 North Lawrence Street
PHILADELPHIA, PA.



TURNER PATENT SPRUE CUTTER

We make a foot-power sprue cutter, strong, rigid, durable; large capacity, good adjustment, good frame. Also a heavy power sprue cutter with belt drive.

TURNER PNEUMATIC MOLDING MACHINE

Designed especially for brass foundries making plumbers' and electrical goods, etc. Built in three sizes.

Our hand Power Molding Machines are highly regarded in numerous large foundries. This new pneumatic type is even better.

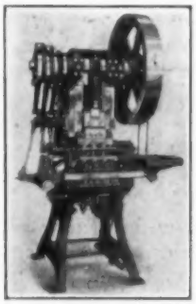
AUTOMATIC COCK GRINDER

With one operator will grind 400 ¾-inch cocks per day.

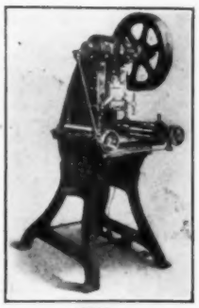
SAND SIFTER AND MIXER

Made with single or double heads. Requires only ½ horsepower. Soon pays for itself.

Send for Catalog M2



A user's unsolicited statement about his Bliss Press—"has been used constantly for forty - five years and is being used at present writing."



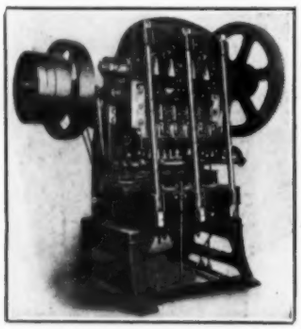
When you buy presses, keep this one fact in mind: you are buying for now and for the future. Consider future savings in operation, in maintenance and increased efficiency.

BLISS

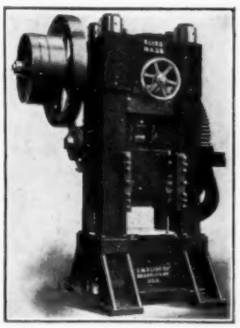
There is a Bliss Press for Every Sheet Metal Working Requirement

BLISS

When you put in presses, why not install Bliss Presses—standard for 57 years—and known in every corner of the globe for their real "press" worth—presses that stand by you year after year.



Talk to us about presses for any and every service

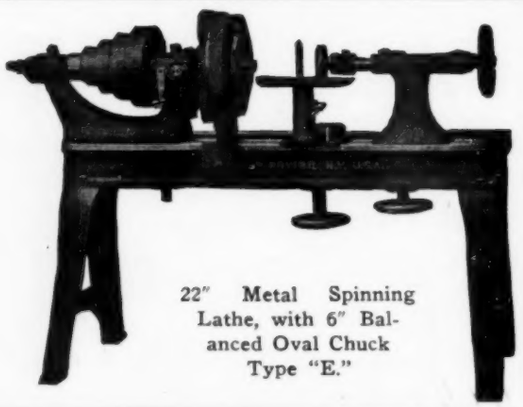


E. W. BLISS CO., 23 Adams St., Brooklyn, N.Y.
Chicago Office: 622 West Washington Blvd.
Detroit Office: Dime Bank Building

PRYIBIL **Metal Spinning Lathes**

"Metal Spinning Lathes and Accessories for round and oval work. Face Plate Chucks, Thread Casting Jigs, Ball Bearing Back Centers, etc. Complete line of Spinners' Tools always on hand. Spinning Lathes from 12" to 44" Swing.
Write for Catalog No. 11 to

P. PRYIBIL MACHINE CO.
512-514-516-518-520-522-524 West 41st Street, New York, N. Y.



22" Metal Spinning Lathe, with 6" Balanced Oval Chuck Type "E."

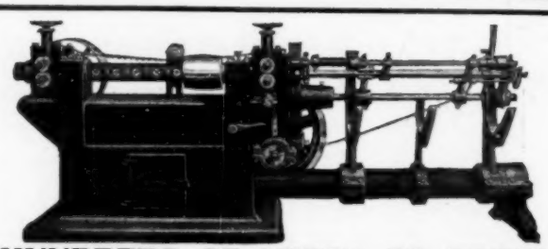
THE TEST OF OWNERS SATISFACTION
We manufacture a complete line of Metal Spinning Tools. They are superior to all others. But we don't ask you to take our word for this. We want you to read what others say about them, this is unprejudiced testimony, it is the final test.

SCHULZ METAL SPINNING LATHES

Equipped With An Exclusive Time Saving Device
This improved machine will save you TIME, MONEY and will CUT your PRODUCTION COST. The "FAVORITE ATTACHMENT" provides for quick release of work without stopping lathe. This is only ONE feature. It has many others.

GET THE FACTS AND THE PROOF
Send for catalog. It describes and illustrates our full line. We will also send you our "Sheet of Proof"—What others using our machines say of our line. Both sent free upon request.

WILCOR MANUFACTURING CO.
Successors to FRITZ A. SCHULZ
4824-4826 West Lake St. - - CHICAGO, ILL.



HUNDREDS OF USERS TO PROVE
that our **AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINES** pay for themselves in a short time.
They take the wire from the coil, straighten it perfectly and cut it to accurate lengths, pieces a few inches long, or several feet long, as required.
Catalogue tells more about them. Shall we send you one?

THE F. B. SHUSTER CO. **New Haven, Conn.**
Formerly John Adt & Son. **Established 1866.**
Also makers of Straighteners and Cutters for rounds, squares, hexagons, and flats, Riveting Machines, etc.

Metal Finishing Equipment

The Divine Wheel Dressing Machine
Something new—first machine of the kind ever made.

Everything for the Polishing Room

Polishing Lathes. Polishing Wheels.
Wheel Dressing Machines. Buffing Wheels.
Automatic Glue Heaters. Arbor Presses.
Balancing Tools. Strapping Belts.
Special Emery Glue. Emery.

We lay out rooms and install complete EQUIPMENT and PROCESSES. Efficiency methods and engineering work.

25 years' experience.

DIVINE BROTHERS COMPANY
Polishing Engineers
UTICA, N. Y.

We are the largest makers of our line of goods in the business. Factory capacity—actual production: Loose buffs—THREE TONS per day. Sewed buffs—TWO TONS per day. Polishing wheels—practically unlimited.

A. GARRISON FOUNDRY COMPANY
ROLLING MILL MACHINERY—PRESSES—SHEARS

(The Pittsburgh Foundry, ESTABLISHED 1863)
S. Tenth and Muriel Sts., Pittsburgh

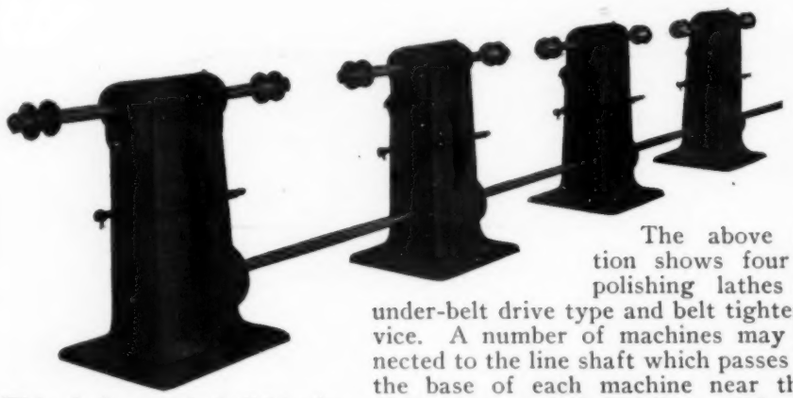
One of our largest departments is devoted to Chilled Rolls. We make Chilled Rolls weighing 37½ lbs. for rolling gold and silver and Chilled Rolls weighing 70,900 lbs. for rolling steel plate. The first Chilled Rolls made in America were made by us and we have made a specialty of Rolls and Rolling Mill machinery ever since; for one customer in particular, of more than National prominence, we have made Chilled Rolls continuously since 1843.

BRASS AND COPPER
ROLLING MILL MACHINERY
And Special Machinery of Any Description
THE TORRINGTON MANUFACTURING CO.,
Torrington, Conn., U. S. A.

AMES SWORD COMPANY
CHICOPEE, MASS.
Manufacturers of
ENDLESS SEWED POLISHING BELTS
Correspondence Solicited Discounts Quoted

PRESSES—ALL TYPES
Press Attachments—Automatic
Metal and Wire Forming Machines
Tumblers—Large Line
Burnishing Machines. Grinders
Special Machines
BAIRD MACHINE CO., Bridgeport, Conn.

Two Pages from our New Booklet on Ball Bearing Polishing Lathes



The above illustration shows four of our polishing lathes of the under-belt drive type and belt tightening device. A number of machines may be connected to the line shaft which passes through the base of each machine near the floor. This shaft runs in ball-bearings and carries a driving pulley within the base of each machine which is connected to the spindle pulley by means of a slack belt. This arrangement is used when there is not sufficient head room beneath the floor to permit the use of regular counter or jack shafts.

The illustration above shows our three sizes of motor driven lathes; No. 1, No. 2 and No. 3. The majority of our lathes have been supplied with direct current motors as the speeds of this type are more readily adapted to polishing requirements. We can furnish the alternating current type motor, but because of the limited range of speeds obtainable there is but small demand for them and accordingly they are built only on special order.

Free Booklet

This booklet is probably the finest piece of literature ever issued on this class of machinery. It illustrates and describes the many sizes and styles of lathes we build. It gives the different spindle types and general specifications on the whole line. A request on your letter head will bring you a copy by return mail.

Gardner Machine Company

BELOIT - - - - WISCONSIN

They Do It Too!

Our Automatic Buffing Machines

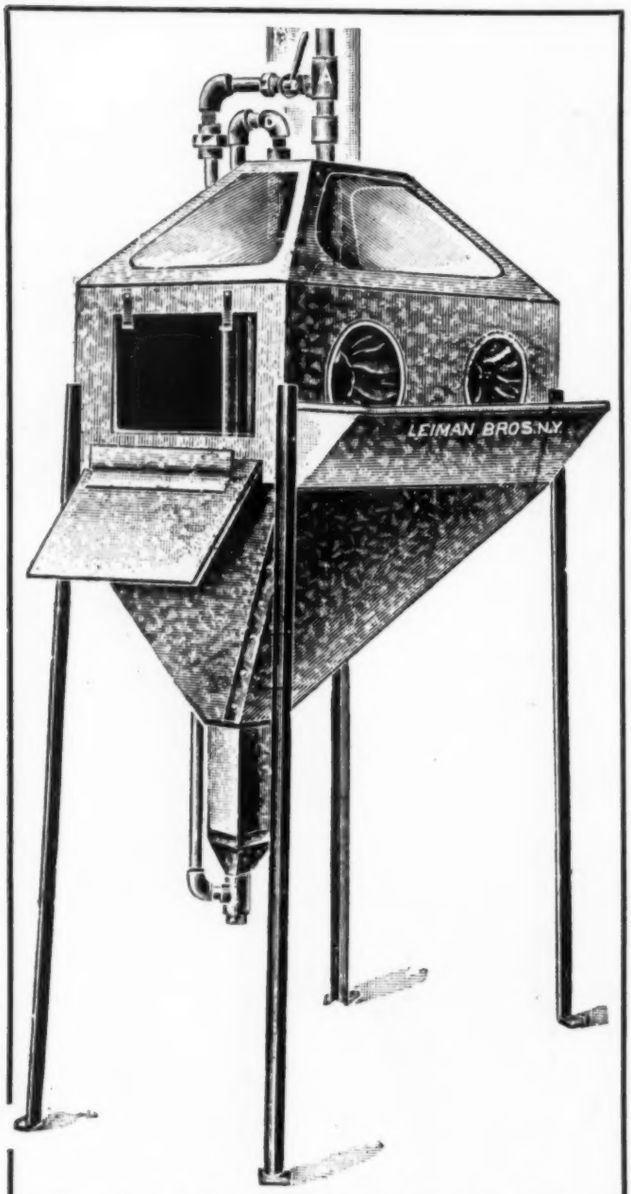
are paying for themselves every 90 days, buffing the articles shown in this cut and many others

Write for Catalog D

Automatic Buffing Machine Co.

56-58 Indiana Street, Buffalo, N. Y.

Canadian Representative: R. M. FOTHERINGHAM, 49 Spencer Ave., Toronto, Ont.



LEIMAN BROS.

SAND BLAST

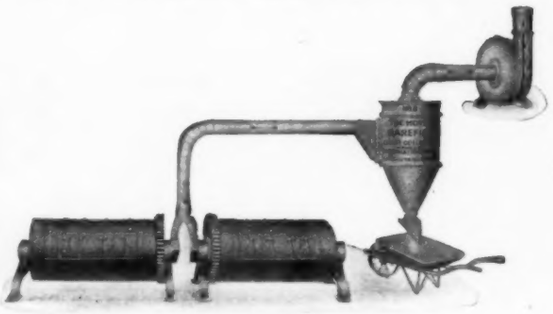
uses the same sand over and over again continuously —anyone, however inexperienced, can operate this machine without hesitation—it is so simply constructed. Sand blasted articles are quickly plated—castings cleaned quickly—letters and designs stenciled on glass or metals, or completely frosted—any degree of finish, whether fine or coarse.

THIS IS THE STANDARD SAND BLAST OF THE MANUFACTURING WORLD

Get Catalog No. 12

LEIMAN BROS.
62J John Street, New York

A Clean Factory at Lowest Cost
maintained by installing
Morse Rarefied Dust Collectors



WHY?

Because the RAREFIED
Saves all wear on the fan
Can be installed at small cost
Lasts indefinitely
Collects all dust heavier than air

Tell us your dust troubles

The Knickerbocker Company
JACKSON, MICH.

BRUSHES

Brass, Copper and Steel Wire Brushes
An assortment of
Machine and Circular Brushes
Chandelier Manufacturers', Silver and Nickelplaters' Brushes, etc.
Repairs Promptly Attended to.

H. BLUMENTHAL & CO., MFRS.
ANDREW H. LAU, Sole Proprietor.
241-243-245 CENTRE ST., NEW YORK
Ask for Catalog "M."

COMPLETE
DUST COLLECTING SYSTEMS
INSTALLED FOR ALL PURPOSES
ARTHUR A. DRACHSLER, Inc.
Tel. Conn. 418 Fourth Avenue, New York

DUST COLLECTORS

The Ohio Blower Co.
5128 Perkins Ave.
CLEVELAND, OHIO

Send for New Booklet Just Out

SEND FOR OUR CATALOGS

BOLAND POSITIVE PRESSURE BLOWERS
Made in all sizes.
Simplest and most positive machine known

BOLAND POLISHING AND BURNISHING MACHINE
With Removable Individual Inner Tubs.
Made in all sizes.

BOLAND PATENTED SELF-FEEDING SAND BLAST
Made in all sizes.

We are the largest builders of Jewelers' and Silversmiths' Polishing Machinery in the World.

WHY EXPERIMENT? WE ARE EXPERTS

Blowers, Hot Blast Dryers, Sinks, Pickle Tanks, Coloring Room Outfits, Dynamos, Sawdust Boxes, and General Factory Equipments. When in Trouble Consult Us

H. J. ASTLE & CO. 118 Orange Street, Providence, R. I.

CLARAGE
KALAMAZOO EXHAUST FANS

Type C. I.—Cast Iron—Exhausters are built in small sizes only. They are adjustable as to Hand and Discharge and may be used either as Single or Double Inlet Fans. All sizes have two bearings in dust proof case. Fans may be inverted to hang from ceiling without change.

Shipment from Stock—Write for Catalogue P-11

CLARAGE FAN COMPANY.
HEATING, VENTILATING & DRYING ENGINEERS.
KALAMAZOO—MICHIGAN—U. S. A.
Eastern Branch—149 Broadway, New York, N. Y.

PEERLESS POLISHING WHEEL

(Sectional View)

A rim of pieces of leather set edgewise on a center of wood and held firmly by a metallic band on which they are strung. A very durable wheel for medium and heavy work. Not affected by atmospheric changes.

Write for Circular "PW."

THE PFLEGHAR HARDWARE SPECIALTY CO.
NEW HAVEN, CONN.

LEAD LINED TANKS

Installed by us over 20 years ago are in active use today.

What better recommendation is required as to the quality of the material and workmanship entering into the construction of these tanks?

Chadwick-Boston Lead Co.,
162 Congress St., Boston, Mass.

RELIANCE BUFFING and POLISHING COMPOSITIONS

We manufacture a superior Lime Finish, Tripoli, Emery Cake, White Coloring Compositions. Our Nubian Lime Finish is superior to all other lime compositions.

Let us quote you and submit samples of our Nubian Lime, Tripoli, Emery Paste, Emery Cake, White Coloring, etc. A trial we feel sure will convince you of the superior quality of our compositions.

POLISHING LATHES

No. 7 Ball-Bearing Lathe

Our No. 7 Ball-Bearing Belt-Driven Lathes enable a great saving in power over other lathes of this kind. Every Grinding, Polishing and Buffing shop should be equipped with these machines.

Write for particulars and prices

RELIANCE CANVAS WHEELS

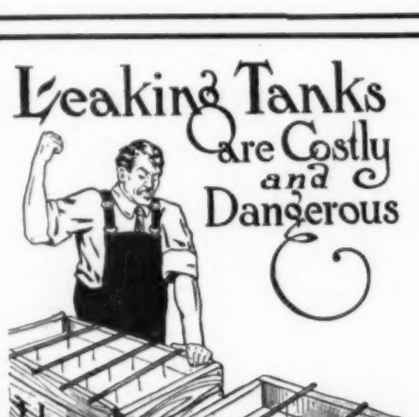
We make them **Hard, Soft** or Medium.
Made only of the best material. Whole Disc Wheels.
Will positively reduce cost of polishing room.
Will take up more emery and require less setting up.
Made and adapted for all classes of work.
Do not fail to send us a trial order for some of these Reliance Canvas Wheels, as we consider them the most economical, results considered, of any Canvas Wheel on the market.

CHAS. F. L'HOMMEDIEU & SONS CO.

POLISHING and PLATING SUPPLIES

24-26 S. CLINTON STREET **CHICAGO, ILL.**

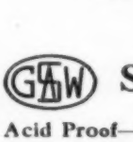
Leaking Tanks are Costly and Dangerous



Why not get

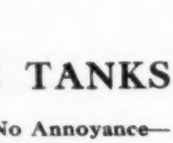
GSW STONEWARE TANKS

Acid Proof—One Piece—No Joints—No Annoyance—Durable—No Depreciation



German American Stoneware Works

Office, 50 Church St.
New York City
Plant, Keasbey, N. J.



ESTABLISHED 1865

PLATING TANKS WITHOUT LINING

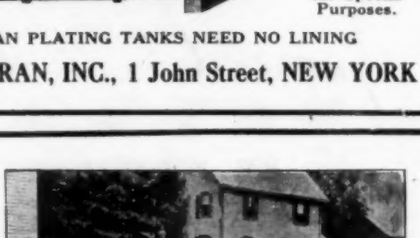
We make **WOODEN TANKS** for Galvanizing, Electroplating, Chemicals, Etc., also **SPECIAL TANKS** for Special Purposes.

CORCORAN PLATING TANKS NEED NO LINING

A. J. CORCORAN, INC., 1 John Street, NEW YORK

We flow on our lining pitch, making a good heavy coating.

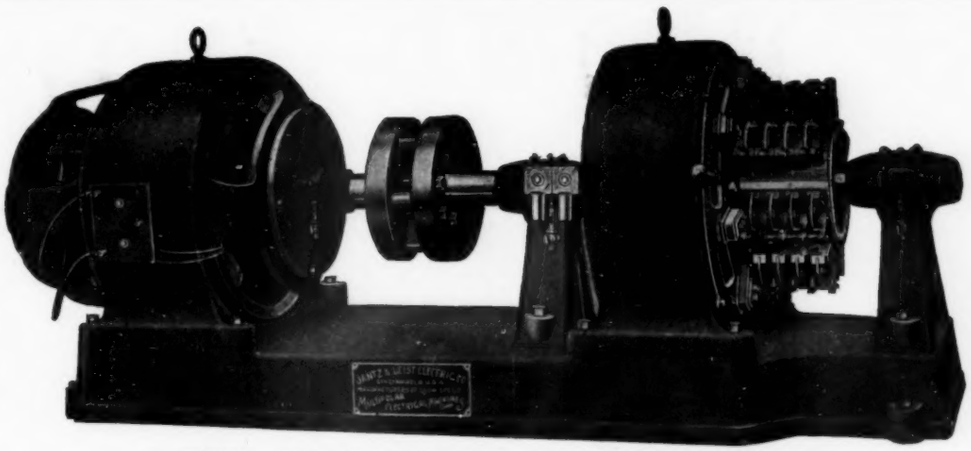
Many only brush it on.



PLATING TANKS MADE RIGHT.

THE A. T. STEARNS LUMBER CO.

Neponset, Boston, Mass.



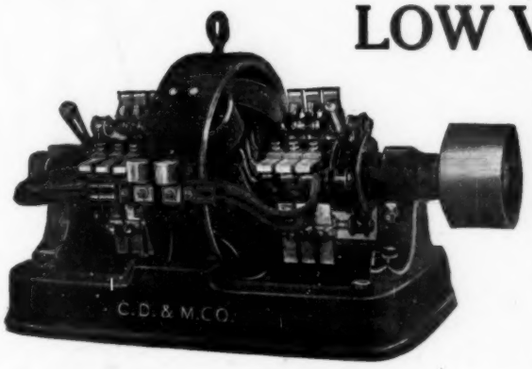
LOW VOLTAGE GENERATORS

FOR general deposition of metals, electro-plating, electro-cleaning and electrotyping, built 2 or 3 wire arrangement, with an adjustable voltage on each side of the neutral. Built in sizes from 400 to 7000 ampere capacity, either belt or motor driven. All our machines are arranged with carbon brushes, held in our reaction type brush-holders, that always feed the brushes to the same position on the commutator, requiring no adjustment for all changes of load, holding the voltage practically even from no load to 25% overload at whatever voltage the rheostat is set for.

Our machines are full and large for full load continuous duty. Some have been in constant service for over 16 years and they are bringing us more orders. All machines are fully guaranteed.

Let us know your requirements and we will recommend the machine most suitable for your special work.

JANTZ & LEIST ELECTRIC CO., Cincinnati, Ohio



LOW VOLTAGE GENERATORS

FROM 25 AMPERES TO 12,500 AMPERES, TWO AND THREE WIRE SYSTEMS. SHUNT, COMPOUND WOUND OR SEPARATELY EXCITED.

This is the celebrated line of dynamos formerly handled by the Zucker & Levett & Loeb Company, and manufactured exclusively by us for them since 1894.

Used Plating Dynamos of almost any make and repair parts furnished promptly. We make

Motor-Driven Grinding, Polishing and Buffing Lathes

Also

THE ROTOPLATER—The first mechanical plating machine and one of the most widely used in the market

OTHER EQUIPMENT FOR PLATERS, POLISHERS AND BUFFERS.
ASK FOR CATALOG "C."

CONNECTICUT DYNAMO & MOTOR CO.
Established 1888 IRVINGTON, N. J.

JOB PLATING

ESTABLISHED 1889

MANUFACTURERS' WORK OUR SPECIALTY

PROMPT ATTENTION GOOD WORK

PLATING
POLISHING
DIPPING
LACQUERING
BARREL PLATING
AND TUMBLING

TELEPHONE, SPRING 2577

LARGEST JOBBING FACILITIES IN NEW YORK CITY

PLANT BOUNDED BY
CENTRE, BROOME AND LAFAYETTE STS.

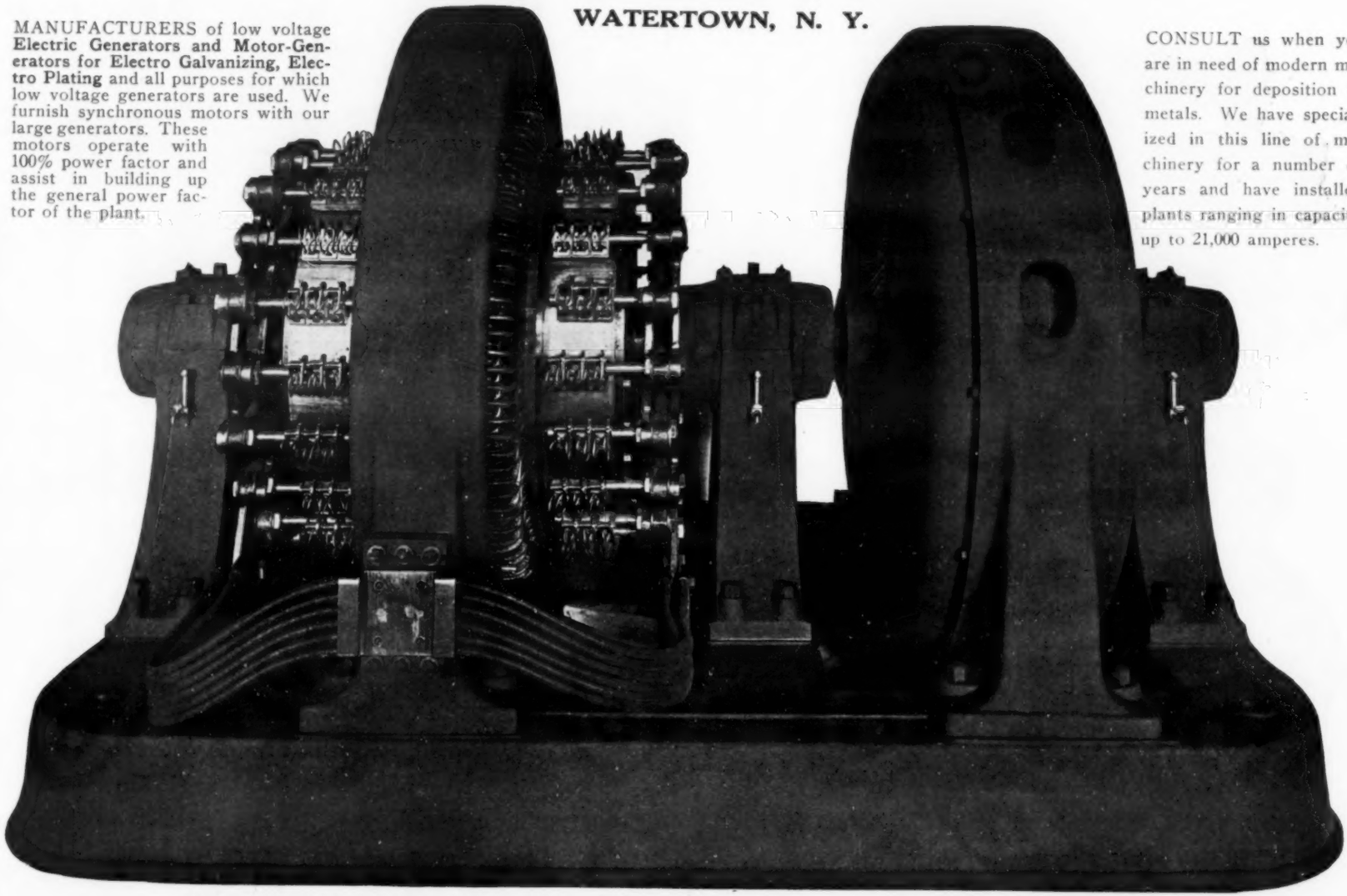
PHILIP SIEVERING
410 BROOME ST., NEW YORK

THE EAGER ELECTRIC CO.

WATERTOWN, N. Y.

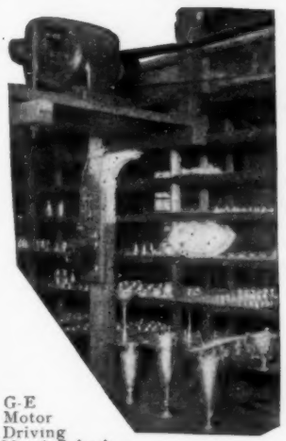
MANUFACTURERS of low voltage **Electric Generators and Motor-Generators for Electro Galvanizing, Electro Plating** and all purposes for which low voltage generators are used. We furnish synchronous motors with our large generators. These motors operate with 100% power factor and assist in building up the general power factor of the plant.

CONSULT us when you are in need of modern machinery for deposition of metals. We have specialized in this line of machinery for a number of years and have installed plants ranging in capacity up to 21,000 amperes.



9000 AMPERE 6 VOLT GENERATOR DIRECT CONNECTED TO A 90 H. P. 3 PHASE SYNCHRONOUS MOTOR

Repeat Orders Testify to Pairpoint Corporation's Satisfaction



G-E Motor Driving Metal Spinning Machines Pairpoint Corporation

Nearly every year since 1902 orders for G-E motors have been received from the Pairpoint Corporation, New Bedford, Mass.

In their jewelry department, as elsewhere, G-E motors supply the power. Here metal drawing and spinning of the highest grade is done under economical and flexible power conditions.

Valuable material is handled with minimum wastage, expensive labor is kept busy and highest grade products are produced under the dependable power conditions assured by G-E motors.

Our engineers will be pleased to lay out a G-E motor drive for your factory.

General Electric Company

General Office: Schenectady, N. Y.

District Offices in:

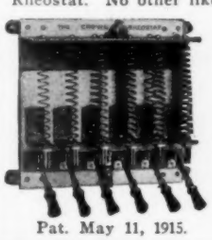
Boston, Mass. New York, N. Y. Philadelphia, Pa. Atlanta, Ga.
Cincinnati, Ohio Chicago, Ill. Denver, Colo. San Francisco, Cal.
St. Louis, Mo.

Sales Offices in all Large Cities 5833

POLISHING AND PLATING SUPPLIES

Complete Plating and Polishing Equipments

If you want regulation in your plating solutions, try a Crown Rheostat. No other like it.



Pat. May 11, 1915.

Dynamos, Compositions, Buffs, Chemicals, Everything for Plating and Polishing

Crown Rheostat & Supply Co.

C. D. Bennett S. E. Huenerfauth

15-17 So. Desplaines St., Chicago, Ill.

DYNAMOS

For Electroplating, Electrotyping and Electro - Galvanizing in single, two and three voltages

60 to 10000 Amperes 3 to 30 Volts

Shunt, compound and separately excited.

Write for Catalogue "M"

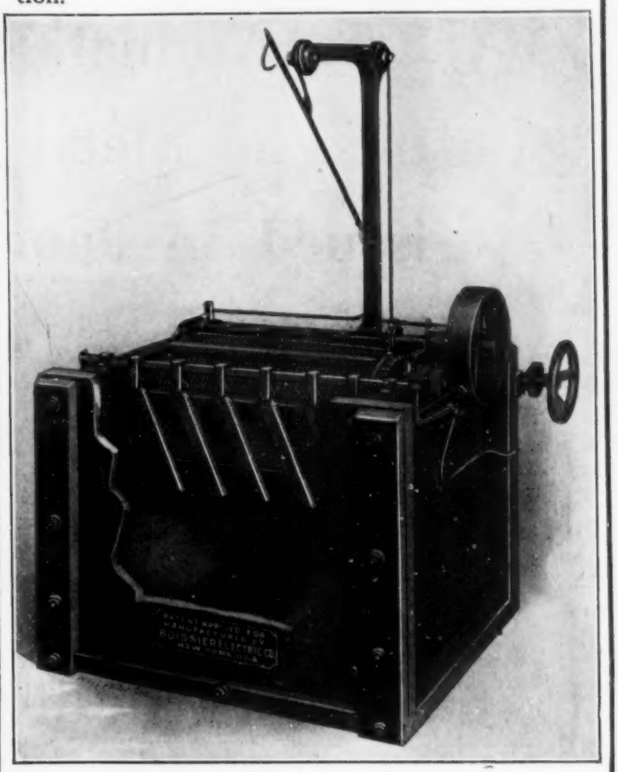
CHAS. J. BOGUE ELECTRIC CO.

513-515 West 29th Street, NEW YORK

Cable Address "MACHELECT" 'Phone, 581 Chelsea.

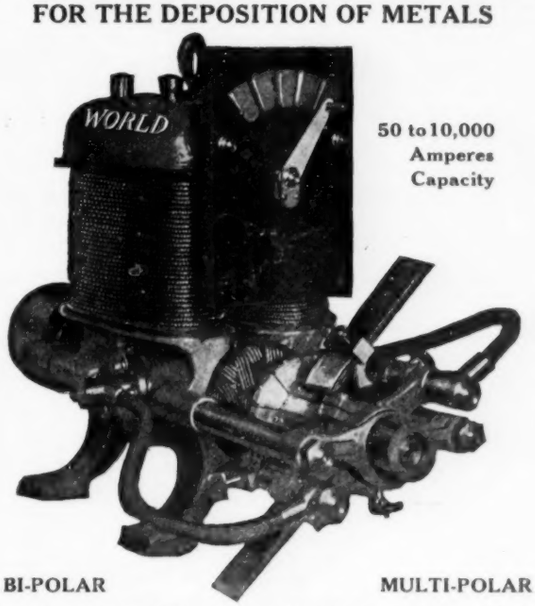
Mechanical Electro-Plating Apparatus

The result of nearly half a century's careful mechanical study by the inventor (H. R. Boissier) and each change from existing types has only been made after careful comparison and experimentation.



"WORLD" Dynamos

FOR THE DEPOSITION OF METALS



50 to 10,000 Amperes Capacity

BI-POLAR MULTI-POLAR

Get New Catalog "W1" *Manufactured Exclusively by*

BOISSIER ELECTRIC CO.

205-209 West 19th Street, New York City

¶ The Annual Review Number of The Metal Industry, to be issued in January, 1916, will be the best number of the year in which to begin or extend your advertising.

¶ Guaranteed Circulation—American, Directory and English editions—19,500 Copies.

The Metal Industry
99 John Street New York

FREE

This brochure takes the place of a personal trip through our shops.

The actual scenes from the factories and the few words of explanation, tell you the things that you wish to know about us.

It tells the whole story interestingly and without taking up much of your time.

Sent free—no obligation, Mention THE METAL INDUSTRY

THE GLOBE MACHINE & STAMPING COMPANY

Cleveland, Ohio

IMPERIAL POLISHING OR BURNISHING MACHINE

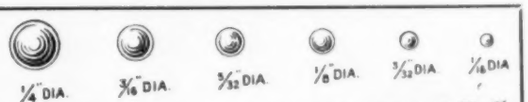
This cut represents another of our labor saving machines.

Floor space occupied by this machine 1¾ ft. x 3¾ ft. Practically four machines combined in one.

No. 11. Patented Sept. 17, 1918.

It will polish one or four different kinds of goods at one time, keeping all separate. This machine is efficient and economical to run—.06c. per week for soap. No other running expense except your power—¼ horse power or less will run it. You can load or unload this machine in less than three minutes and be off about other work. It handles frail or staple goods as well. Our new soap powder best ever. Does not gum or scum. Will bring luster quickly.

We build these machines with one to six compartments. Great labor savers. **WRITE FOR CATALOG "I-P"**



GLASS-HARD STEEL BALLS

SMITH, RICHARDSON COMPANY, ATTLEBORO, MASS., U. S. A.

A Better Finish Than Yours at Less Cost

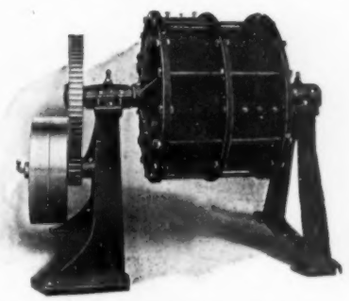
—that is what your competitor, who uses the **Abbott Steel Ball Tumbling Process** for polishing, buffing and burnishing all kinds of articles and parts, gives his customers.

How long can you stand such competition? Better send us (express prepaid) a few sample pieces to finish for you and let us report just what it will cost you to apply the **Abbott Process** to your work and how much you can save by doing so.

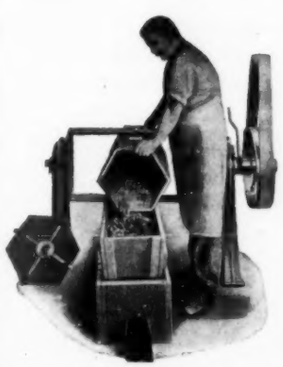
Booklet "A B C" Tells the Story

THE ABBOTT BALL COMPANY, Abbott Street, Elmwood District, Hartford, Conn.

We are also furnishing all grades of BEARING BALLS from the cheapest to the HIGHEST, and are running our factory 24 hours a day to supply the trade. If you are interested we shall be pleased to quote you.



A Two-Compartment Abbott Burnishing Barrel.



Patent Pending

Machine Finishing Replaces Expensive Hand Labor

THE Parsons Patented Process displaces costly hand work on thousands of articles, yielding a much superior general finish to that done by hand labor. This process and machines are a revelation in results produced in finishing and buffing of sheet metal articles and parts as well as on drop forgings, small castings, etc., which are ground and finished in a superior manner.

One of the secrets of success is the Parsons highly polished metal pieces, which get into corners that can not be reached by steel balls or hand labor. The Quick-as-Lightning Device for removing and attaching the cover, with the handy means for tilting, emptying and refilling are others, and more are shown in the booklet describing process and machines. **Success wins here** where others fail. **You will all use this process and the Parsons machines sooner or later;** why not now? Travel in the van of progress.

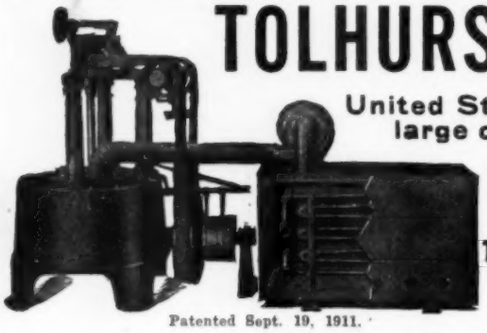
Two large concerns equipped with the Parsons machines to operate under his patent process last week. You had better be one of the next to do so. Address for terms,

W. R. PARSONS

411 S. Clinton Street **Chicago, Illinois**

Drying Metal Goods in Sawdust Is a Thing of the Past

TOLHURST METAL DRYER and BRIGHTENER



United States Mints and many large concerns use them

No sawdust required

Sizes from 12' to 40'

Write for Circular C.I.

TOLHURST MACHINE WORKS

TROY, N. Y.

Patented Sept. 19, 1911.

Patented Sept. 19, 1911.

EUROPEAN REPRESENTATIVE—Ernst Bernheim, Ludw. Loewe-Haus, Düsseldorf, Germany.

No Tarnish
No Bite

QUICK—LIKE A METEOR AND DEPENDABLE

Rush Days have no terror when your cleaning tanks contain a solution of

MINERAL CLEANER

"It cleans metals swiftly."

THE ELECTRIC SMELTING & ALUMINUM COMPANY
LOCKPORT, N.Y.

Mineral Cleaner for Electro Platers

Ask for Booklet

Made in U. S. A.

THE NO-DUST DRYING MACHINE COMPANY OFFER A LINE OF MACHINES FOR DRYING METALS IN ANY AND EVERY SIZE, SHAPE, QUANTITY, QUALITY —FROM GOLD TO IRON—GUARANTEEING BETTER AND QUICKER RESULTS THAN HERETOFORE OBTAINED.

WE CAN HELP YOU ON THIS SERIOUS PROBLEM—DRYING.

NO-DUST DRYING MACHINE CO., 40 CLIFFORD ST., PROVIDENCE, R. I.

NIAGALK POTASH

Made by

NIAGARA ALKALI CO.

Niagara Falls, N. Y.

"STITTINE"

THE PERFECT METAL CLEANER

Will positively remove all grease and oil from metal, giving a perfectly clean surface without tarnishing, staining or destroying the lustre or polish of the metal.

Gives off no fumes, throws down no precipitation, and will not injure the skin.

Write today for our free offer in order that you may satisfy yourself as to the merits of this truly great Cleaner.

JAMES H. STITT COMPANY

225 Fifth Avenue New York, N. Y.

1916 CONTRACTS

IT is generally conceded that heavy chemicals are sold at lower figures in Connecticut than in any other section of the United States. For this and other reasons, it ought to be for our mutual advantage to have you communicate with us before placing your orders and 1916 contracts elsewhere.

Our Equipment

We have three large warehouses situated on a railroad siding. We buy practically all of the principal chemicals in carload lots. Especially the question of delivery should play an important part, as we make immediate **shipment from stock** by trolley freight or railroad freight. We have a new, up to date laboratory, and analyze all of the chemicals we buy. We know of no other house as well equipped in all these respects as we are. We mention below some of the articles which we are particularly anxious to sell you.

Anodes—Nickel, Brass, Copper and Zinc

We have a new foundry, completed early in 1915. Our casting is done under the careful supervision of our chemist, and borings from each lot of Anodes cast are tested in our laboratory before shipment is made. We, therefore, are sure of the quality of the goods we offer, and guarantee them satisfactory in every way.

Cyanide

We buy in carload lots, and are in a position to make prompt shipments of any grade you wish. Ask us for prices before placing your business elsewhere.

Cream Tartar Substitute

This material is being used by all the factories in this vicinity for rolling metal goods, drawing and rolling copper wire, and tin plating brass goods. It gives as good results as Pure Cream Tartar. Price is much lower and it requires a smaller quantity to do the same work.

Turpentine

We have an 8000 gallon storage tank in our yard, and purchase our supply of PURE GUM SPIRITS OF TURPENTINE in tank cars shipped direct from the South. We ship it out to our customers in steel drums, galvanized inside and outside, and fitted with a ¾" vent in the head to take a faucet and a 1½" bung on the side between the rolling hoops from which the Turpentine can be pumped. We guarantee the quality ABSOLUTELY PURE and the packages FULL WEIGHT. Please write us for price whenever you are in the market.

Wyandotte Cleaning Specialties

We are Connecticut agents for the J. B. Ford Company and carry carload stocks of their various products. We have access to their various storages in the different cities and can make direct delivery.

Nickel Salts, Cleaning Compounds, Sal Ammoniac

AQUA AMMONIA, WOOD AND DENATURED ALCOHOL, TRIPOLI COMPOSITION, BORAX SODA ASH, CAUSTIC SODA, ACETIC ACID, BLEACH, Etc., are some of the articles we can furnish to advantage also, and we would be glad to have your inquiries for prices. We also supply GALVANIZING SALTS, ACETONE, EMERY, ROUGE, GLUE, BUFF WHEELS, Etc.

Situated as we are in the centre of the largest metal producing section of the country, and having supplied the principal factories for the past 65 years, we are very familiar with all the various chemicals used in the manufacture of metals. Please send us a list of your requirements. We know that you will be surprised at the prices we are able to quote.

We Guarantee the Quality of All of Our Chemicals to Be Exactly as Ordered.

The Apothecaries Hall Company

18 Benedict Street **Waterbury, Conn.**

Quoted 50% Less

Open or Loose Triplex Buff

than Market Price on Buffs Would Make You Jump at the Bargain. The

TRIPLEX BUFF

Saves You 50% and More

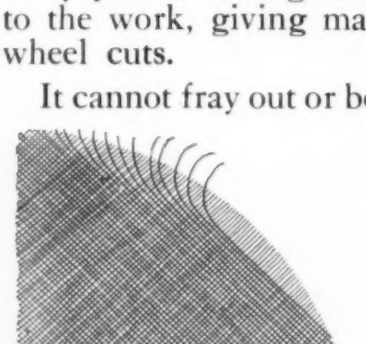
Sewed Triplex Buff

FOR both cutting down and polishing the Triplex Buff does Better Work, Faster Work, uses less composition and lasts two to three times longer than the ordinary Buff because—

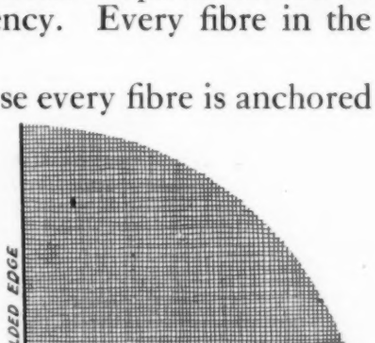
By patent folding of the elements every fibre cord is presented direct to the work, giving maximum cutting efficiency. Every fibre in the wheel cuts.

It cannot fray out or become flat-sided because every fibre is anchored in the body of the wheel and must wear down.

The pockets formed by the folds hold the buffing composition, where it does better work and saves at least 20% of it.



Disc section of ordinary buff. Note how threads fray out, resulting in a flat sided wheel, poor working efficiency and short life.



Section of Triplex Buff obtained by patented folding. Note every thread extends into the body of the wheel and the fibre ends stand out direct to the work.

Now when the Triplex Buff is worn down it can be rebuilt at low cost into a buff of the original diameter, two worn down sections making one full diameter section. This makes the Triplex equivalent to two and one-half to three and a half ordinary Buffs.

Isn't saving half your buffing bills worth investigating? For numerous other points on the Triplex Buff and reducing Buffing costs, write for our Bulletin M200, also **get a Triplex and try it.**

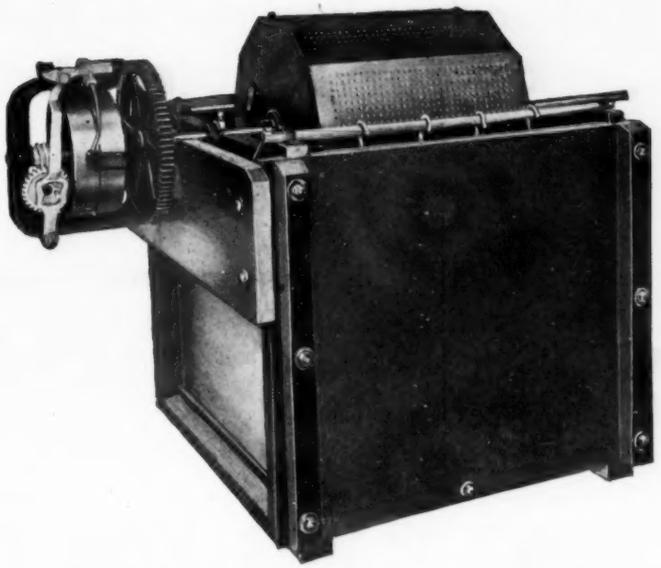
MUNNING-LOEB COMPANY

MATAWAN, NEW JERSEY

Manufacturers of

ANODES BRUSHES BUFFS "NONE-SUCH" CARBOY ROCKERS CHEMICALS COMPOSITIONS DYNAMOS
LATHES "NONE-SUCH" ROTATING PLATING MACHINES SALTS ROUGES TANKS WHEELS

MEAKER INTERMITTENT GALVANIZING BARREL



ANOTHER MEAKER SUCCESS

A new Machine and a new solution form the combination that produces the prettiest galvanizing you ever saw.

Like everything else we make, this new Meaker Unit is honestly and liberally built. A machine without frills, simple in construction, built for service and low in cost.

WRITE FOR DETAILS

You will certainly find it worth your while to investigate the MEAKER GALVANIZING BARREL. It is one more step in the march of galvanizing progress.

We issue a number of descriptive booklets, in which our INTERMITTENT ROTATING BARREL and other units are described, and they are all yours for the asking. Check the ones you have not read and mail the list to us.

GALVANIZING ECONOMY,
HISTORY AND DEVELOPMENT OF THE GALVANIZING INDUSTRY,
THE LIVE ISSUE,
MEAKER GALVANIZING,
REPRODUCED LETTERS OF ENDORSEMENT.

A description of our INTERMITTENT GALVANIZING BARREL appears in this issue of THE METAL INDUSTRY on page 514. Why not read it?

THE MEAKER COMPANY

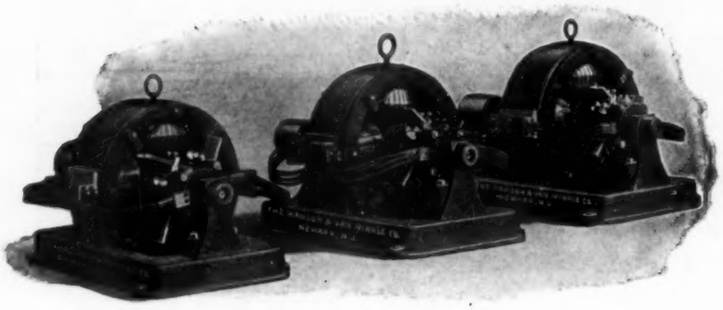
1243-49 Fulton Street **CHICAGO, ILLINOIS**

Platers and Polishers Supplies

We Furnish Everything Required and Manufacture

Dynamos for Electroplating

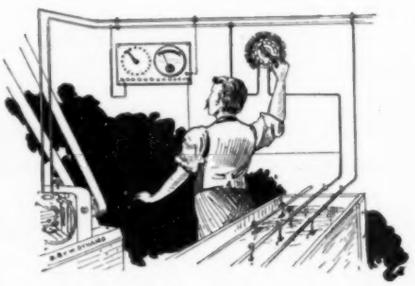
From 50 to 10,000 Amperes



Also Motor Generator Sets

LOOK OVER YOUR PLATING ROOM CAREFULLY

and consider, if it may not be possible to turn out a greater quantity of better finished work in a shorter time and at less expense. Then write us, and arrange for an appointment to come and see us, or to send your plater, to look over our various labor and time saving devices. We are sure it will pay you and our experts will give you a demonstration and any necessary advice, without cost.



We have in operation a very complete and up-to-the-minute mechanical demonstrating department.

WE ARE THE ORIGINATORS OF **COLD GALVANIZING.** AMERICAN PROCESS. SAMPLES AND INFORMATION ON APPLICATION AND HEADQUARTERS FOR

Write for Bulletin 117

The Hanson & Van Winkle Co.

ESTABLISHED 1820

MAIN OFFICE AND FACTORIES
269-271 Oliver Street, NEWARK, N. J., U. S. A.

81 Walker Street, NEW YORK
108-110 N. Clinton Street, CHICAGO, ILL.
SAN FRANCISCO Agency, 268 Market Street

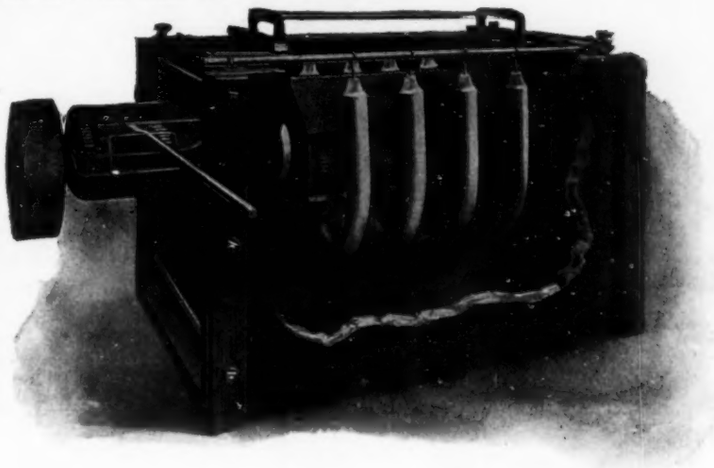
CANADA OFFICE: Canadian Hanson & Van Winkle Co., Limited, Morrow Ave., Toronto, Ont.

Mechanical Electro-Plating Apparatus

United States Patents June 22, 1897—Feb. 24, 1903—Oct. 11, 1904—March 24, 1908—May 19, 1908.
Canadian Patents Nos. 58,205 and 97,852. Other Patents Pending.

These machines are for electro-plating quantities of small work in bulk, saving time, labor, and expense.

If you have a mechanical Plating Proposition of any kind, put it up to us. We lead in this branch as in all others.



STYLE B.

The Hanson & Van Winkle Co.

MAIN OFFICE AND FACTORIES
269-271 Oliver Street, NEWARK, N. J., U. S. A.

ESTABLISHED 1820.

81 Walker Street, NEW YORK.
108-110 N. Clinton Street, CHICAGO, ILL.
SAN FRANCISCO Agency, 268 Market Street.

CANADA OFFICE: Canadian Hanson & Van Winkle Co., Limited, Morrow Ave., Toronto, Ont.

COPPER CARBONATE

(TRUE BASIC, FREE OF SULPHATES)

Actual tests indicate that sulphates not only contaminate the solution, but impair the efficiency of the Cyanide. We would be glad to send samples so that you may demonstrate this to your own satisfaction.

As specialists in the manufacture of chemicals for all kinds of electro deposition, we invite your correspondence and inquiries.

JOHN C. WIARDA & COMPANY

263 GREEN STREET, BROOKLYN, N. Y.
Factory—Green, Provost and Freeman Streets
Storage Warehouse—Huron, Provost and India Streets

E. REED BURNS SUPPLY CO.

40 and 42 Withers St. Brooklyn, N. Y.

Manufacturers of

Nickel Anodes and Salts — **Rouge**
Tripoli Emery Crocus — **Buffs**
Compositions — **White Finish**

Prompt Shipment from Stock

WELL! WELL!

(Overheard at The Chipman Co. Plant.)

"Say, Pete. That sure is some fine oxidized copper finish. I have never seen anything better. And how it does spot out! How did you do it?"

"You just send in a trial order to the C. G. Buchanan Chemical Co., Cincinnati, Ohio, for some of their TRI.B. SULPHURETTE; that's what did it. Of course, I could, but I wouldn't be without it now."

TRI-B BRAND

No amount too small — None too large. Do it now

No charge, if not entirely satisfactory.

C. G. Buchanan Chemical Company
Manufacturers of Industrial Chemicals
Cincinnati, Ohio

SAVE 25%

IN PLATING COSTS
BY USING

CHEMICALLY PURE

METAL CYANIDES

IN

COPPER, SILVER, BRASS, BRONZE

SOLUTIONS

FOR FULL INFORMATION AND BOOKLET "B" WRITE

THE ROESSLER & HASSLACHER CHEMICAL CO.

100 William Street, New York

Aeron System in operation.

This man using the Aeron saves 75% in time and labor.

Getting Aeron Finishing System Results

—Is placing your finishing room on a maximum time and labor saving, on a maximum power saving and on a highly efficient working basis;

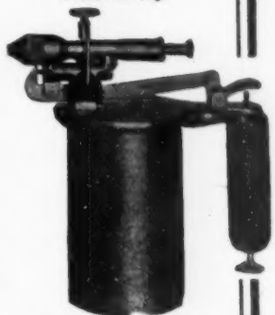
—Is giving your product a finish that is decidedly superior in quality.

The AERON SYSTEM with its complete Accessory Equipment does more than merely apply lacquers, enamels, varnishes, japans, bronzes or celluloid materials: it produces a finer grade of work than is possible with any other method; it saves 50% and upwards in time and labor; it produces maximum exhausting results at 1/10th the cost of operating other less efficient methods; it saves floor space; it eliminates the possibility of finishing room congestion.

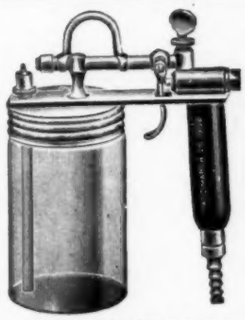
The fact that it is making good throughout the metal industry, and the additional fact that we sell it to you on a guaranteed basis, supply every reason why you should be getting AERON SYSTEM results in your finishing room. LET US EXPLAIN MORE IN DETAIL, and send a booklet of equipment facts. ADDRESS—

The DeVilbiss Mfg. Co. 1305 Palmwood Ave. Toledo, Ohio

One type of Aeron with attached cup.



There's an Aeron for every purpose.



Pat'd March 25th, 1902. Pat's Pending.

The EUREKA SPRAYER

is the original and only practical one

Why Pay $22.00 for a Sprayer?

We Sell an Outfit at $40.00

Including Compressor, Tank, Gauge, Safety Valve, Drain Cock, Air Filter, Hose and Sprayer. Sensitive finger control, pressure reducing valve. 14 years' success. Prices right. Air Compressors, Receivers, Etc., always in stock.

SEND FOR CATALOG.

Eureka Pneumatic Spray Co., 62-64 Ninth Ave. NEW YORK

FRED'K CRANE CHEMICAL CO., Sole Agents for Great Britain, Birmingham, England.

You Can Afford the BEST Lacquers

if you use ECLIPSE AIR BRUSHES—because they operate under low pressure and do not waste a large portion of the lacquer by blowing it into the air, as all high pressure sprayers do. What you save in quantity can be put into quality, thus producing a better finish at the same, or a lower, cost for lacquer.

ECLIPSE AIR BRUSHES

require only 3 to 10 lbs. air pressure. Save 50 Per Cent of material. Save 75 Per Cent in labor. Give a decidedly superior finish.

Every machine guaranteed to make good. Expert demonstrators at your service.

Write for new booklet and prices

ECLIPSE AIR BRUSH COMPANY

77 ORANGE ST. - - - Newark, N. J.

Patented July 21, 1914 Jan. 19, 1915 other patents pending

Model "S" underslung jars with aluminum covers

PAASCHE'S QUICK ACTION 3 IN 1 AIR BRUSHES

THE BEST OF THEM ALL

for applying paints, enamels, lacquers, bronzes, shellacs, celluloid and liquid materials of all descriptions to any kind of surface. So simple, durable and practical that they will withstand the hardest and roughest usage. No weak, delicate parts or mechanism to clog or get out of order. Made in various styles and sizes to suit all kinds of work.

SEND FOR ILLUSTRATED DESCRIPTION AND PRICES.

Paasche Air Brush Co., Manufacturers 9 South Clinton St., Chicago, Ill.

THE STEINER SECTIONAL AND PORTABLE OVENS

DIRECT OR INDIRECT HEATING

Superior Construction, Economical Operation

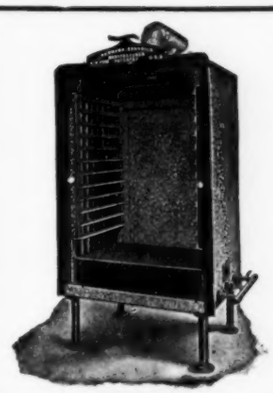
For Japanning, Lacquering, Drying and adaptable for many other purposes.

Drying Out Boxes

Fitted with steam coils or gas burners, where steam is not available.

Send for Catalogue "M."

E. E. STEINER & CO., 60 Union St., NEWARK, N.J.



Patented

THE GEHNRICH INDIRECT HEAT RADIATOR OVEN

Approved by the Board of Fire Underwriters

The greatest advance yet made in oven construction

Used for Japanning, Lacquering, Enameling.

Other Ovens for Core Baking, Drying, Tempering, Sherardizing.

Send for Catalog "TMI."

HERMANN GEHNRICH, Manufacturer

60 Franklin Avenue Brooklyn, N. Y.

DU PONT

BRONZING LIQUIDS

ARE DISTINGUISHED

BY THEIR UNIFORMITY

WE use the best of material and employ only approved methods for producing bronzing liquids of their highest quality.

Extensive experience in the laboratory and factory is assurance that we can produce bronzing materials adapted to any requirements.

Prospective customers should state their needs to enable us to send samples, or permit us to make a practical demonstration of the superiority of DU PONT BRONZING LIQUIDS.

DU PONT CHEMICAL WORKS

SUCCESSOR TO INTERNATIONAL SMOKELESS POWDER & CHEMICAL CO.

Equitable Bldg. New York City

Preference and Choice

Those who KNOW Lacquers and have used other Lacquers in comparison with Egyptian, unfailingly express a preference for Egyptian. There are many reasons. You will find them in our literature. We will be glad to send this upon request, or, better yet, let us send you a trial order.

The Egyptian Lacquer Mfg. Company

152 Front Street, NEW YORK CITY

FRANKLIN H. KALBFLEISCH CO.

Manufacturers of

Acids, Ammonia, Chemicals and Lacquers

CHEMICALS–LACQUERS

Metropolis Building, Broadway and 16th St.

NEW YORK

Works at Brooklyn, N. Y., Waterbury, Conn., Erie, Pa., Elizabeth, N. J.

CHAS. COOPER & CO.

194 WORTH STREET, NEW YORK

A FULL LINE OF

CHEMICALS

SEND FOR PRICE LIST

ESTABLISHED 1857

BAKELITE LACQUER

RESISTS

Temperature of 500° F., Oil, Water, Steam, Chemicals, Solvents and Atmospheric Influences.

INFORMATION UPON REQUEST

GENERAL BAKELITE COMPANY

100 William Street, New York, N. Y.

NICKEL SALTS
NICKEL PLATERS' MATERIALS
A SPECIALTY

Fuerst Bros. & Co.

2 Stone Street New York

We are NOT in the Lacquer Business

but furnish the ingredients for the lacquer men. Can you see the moral? Amyl Acetate, Ethyl Acetate, Refined Fusel Oil, Acetone Oil. Highest quality, war or no war.

FRANCO-AMERICAN CHEMICAL WORKS, Carlstadt, Bergen County, N. J.

BRASS, IRON, COPPER

DIPPING BASKETS

Any Shape, Size or Mesh

Most highly recommended baskets. Extensively used throughout New England for many years. We make our own wire cloth, so can quote attractive prices. Send for Pamphlet "B."

JOHN P. SMITH & CO.

495 State Street, New Haven, Conn.

Mfrs. of Wire Cloth, Wire Machinery Guards, Wire Work for Every Purpose.

We wish to thank our friends for their support, which has made this last year the largest in our history.

The lacquer business has had many difficulties to contend with, both in getting supplies and in the matter of excessive cost. We have been practically cut off from foreign supplies. Costs have been high and beyond our control. Our customers have, however, cheerfully co-operated with us, and we deeply appreciate it.

CELLULOID ZAPON COMPANY

MAKERS OF GOOD LACQUERS

NEW YORK CITY
200 Fifth Avenue

LOS ANGELES, CAL.
San Fernando Building
406 So. Main Street

CHICAGO, ILL.
45th and La Salle Sts.

IMPROVED SWAGING MACHINERY

FOR POINTING AND REDUCING
ROUND ROD AND TUBING
BY THE "COLD PROCESS"

No. 3 Rotary Swaging Machine (5671)

The machine illustrated represents a line of Rotary Swaging Machines which are used for pointing, reducing and shaping round rod and tubing by the cold process preparatory to drawing through dies on a bull block or draw bench, and are also in very extensive use in the manufacture of staple articles in the metal trade, such as hose nozzles, tapered shells, screw and bolt work, shanks for tools, etc. They are used by manufacturing jewelers for reducing the bar or ingot of pure or plated metal to a small size suitable for drawing on individual blocks or continuous wire drawing machines and are built in several sizes having capacities ranging from ¼" to and including 1½" diameter.

THE WATERBURY FARREL FOUNDRY & MACHINE CO.
WATERBURY, CONNECTICUT, U. S. A.

MAIN OFFICE AND WORKS
465 BANK ST.
WATERBURY, CONNECTICUT

WESTERN OFFICE
1012 WILLIAMSON BLDG.
CLEVELAND, OHIO

SAFETY FIRST!

My new Ball Bearing Lathe embodies every best idea in lathe construction. Highest grade Swedish ball bearing used throughout. The loose pulley runs on ball bearings. It can be driven from overhead or from beneath. A belt shifting device and a removable pulley cover are "Safety First" improvements and in most cities are required by the law. The weight of this machine is 600 lbs.

I manufacture and sell every necessity for your foundry or for your plating and polishing departments.

DOUBLING UP

This is the era of concentration; in other words, of "doubling up." Making the most of every advantage is doubling the opportunity.

That's the reason that I not only supply Electro-Plating equipment, but I also manufacture Buffing Compositions and platers' supplies and can equip a polishing plant or an electro-plating plant, from Dynamos to brush wheels and all along the intermediate line of travel. Use my TRIPOLI COMPOSITION—"every particle a cutting article" for "cutting down"; my WHITE COLUMBIA COLORING COMPOSITION for "coloring" brass fittings, etc.

My representatives on the road sell all of these lines and go against other houses selling only one line; it costs as much to sell one as to sell all. It needs a smaller slice of profit when selling all; I take the small slice and leave you the rest.

FREDERIC B. STEVENS
DETROIT, MICHIGAN

DIRECT BRANCH
Hoosier Supply Co., Indianapolis, Ind.

WAREHOUSE AND OFFICES
Cor. Larned and Third Sts.

EXPORT WAREHOUSE
Windsor, Ontario

Sales Agencies—Acme Nail & Supply Co., Cleveland; Crown Rheostat & Supply Co., Chicago

ALUMINUM COMPANY OF AMERICA

PITTSBURGH, PA.

ALUMINUM

SHEET TUBING
EXTRUDED SHAPES
ROD RIVETS WIRE
ELECTRICAL CONDUCTORS

Branch Offices

NEW YORK—120 Broadway
BOSTON—131 State St.
CHICAGO—1500 Westminster Bldg.
PITTSBURGH—2420 Oliver Bldg.
ROCHESTER—1112-1114 Granite Bldg.
CLEVELAND—950 Leader-News Bldg.
WASHINGTON—512-513 Metropolitan Bank Bldg.
DETROIT—1512 Ford Bldg.
PHILADELPHIA—1216-1218 Widener Bldg.
KANSAS CITY—308 R. A. Long Bldg.

ALUMINUM COMPANY OF AMERICA

Pittsburgh, Pa.

Ingot ALUMINUM Alloys

Prices on Application

PURE MANGANESE 98-99%

and

MANGANESE ALLOYS

of various compositions, carbon free and technically free from iron and other impurities, in convenient size, for:

Brass and Bronze	Nickel
German Silver	Aluminum
Monel Metal	Composition

Write for Metals Booklet No. 2058, which contains full information on the subject and many useful formulas and suggestions.

Goldschmidt Thermit Co.

WM. C. CUNTZ, General Manager
90 WEST STREET NEW YORK CITY

7300 So. Chicago Ave., Chicago
329-333 Folsom St., San Francisco. 103 Richmond St., W., Toronto, Canada

TITAN BRONZE

is

FORGEABLE

And when cold rolled is

STRONG as STEEL

SHEETS RODS FORGINGS
CASTINGS RECASTING INGOTS

COLD Rolled and Drawn Bars HOT!

Hot or Cold Rolled Sheets
for Hot or Cold Forming

Our ROLLING MILL is UNEXCELLED

TITAN METAL CO.

BELLEFONTE, PA.

Metallic Bismuth and Cadmium.
Every Grade of Babbitt Metal.
Tin, Copper, Spelter, Antimony.
Aluminum and Alloys.
Lead, Pig, Ingot and Bar.
Solders.

U. S. REDUCTION CO., CHICAGO. WORKS: East Chicago, Ind.

TRADE MARK

AJAX PHOSPHOR BRONZE

For Bearings, is a leaded bronze of the standard composition, which has been on the market for many years.

It is particularly recommended for bearings which are required to carry extreme loads and thrusts, for example: on bearings doing heavy duty, viz., connecting rods, etc., where the strains are so severe that the more highly leaded bronzes cannot be used, because of their inferior compressive strength.

AJAX PHOSPHOR BRONZE is made to the standard Railway Specifications, and the specifications of the American Automobile Engineers' Association.

We have unusual facilities for making Phosphor Bronze, and we believe that our Company produces more of this alloy than is produced in all other foundries in this country combined.

THE AJAX METAL COMPANY

Established 1880

SOLE MANUFACTURERS

Main Office Philadelphia, Pa. — Southern Plant Birmingham, Alabama

District Offices

New York Chicago Washington St. Louis Pittsburgh San Francisco

ROYAL PHOSPHOR COPPER

Guaranteed 10% and 15% Phosphorus

25% ROYAL MANGANESE COPPER

10% and 25% ROYAL SILICON COPPER

R. F. LANG

8 and 10 Bridge Street

NEW YORK

DECREASE YOUR DEFECTIVES

BY USING

ALUMINUM

OF

QUALITY

PURE INGOTS AND ALLOYS

WRITE FOR PRICES

"THE BEST CURE FOR BAD CASTINGS IS GOOD INGOTS"

UNITED SMELTING & ALUMINUM COMPANY

NEW HAVEN, CONN.

ALUMINIUM

IN ALL COMMERCIAL FORMS

The British Aluminium Co., Ltd.

U.S. Agent—Arthur Seligman, 165 Broadway, N. Y.

Canadian Office—60 W. Front St., Toronto

WATERBURY BOOK OF ALLOYS BY R. A. WOOD.

"Probably the most notable contribution that has been made to the literature of the manufacture of brass." Furnishes a starting point for those who wish to become acquainted with the manufacture of brass alloys. Sold only on subscription and it is proposed to furnish to subscribers from time to time additional matter in the form of loose sheets which may be added to the original work. The author, a practical brass man of long experience, also places himself at the disposal of his subscribers for consultation on problems which may come up in everyday work. Size 8 x 9½ inches. Loose Leaf Construction.

Subscription Price $5.00. For Sale By

THE METAL INDUSTRY, 99 John St., New York.

ESTABLISHED 1850

JOHN HASSALL, INC.

CLAY AND OAKLAND STREETS

BROOKLYN, N. Y.

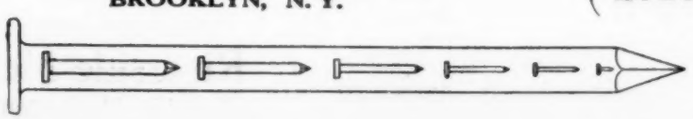
QUICK DELIVERIES

RIVETS

ESCUTCHEON PINS

SPECIAL WIRE NAILS

IN ALL METALS



MANUFACTURERS OF PLATE, SHEET, ROD, WIRE, TUBE, INGOTS, METAL GOODS

DIRECTORY

METAL ROLLING MILLS

MANUFACTURERS OF PLATE, SHEET, ROD, WIRE, TUBE, INGOTS, METAL GOODS

THE
AMERICAN BRASS COMPANY
WATERBURY, CONN. U. S. A.
Manufacturers of
Brass, Copper and German Silver
in every variety of
Sheets, Rolls, Plates, Wire, Rods, Seamless and Brazed Tubing, Mouldings, Circles and Shells, Bare and Insulated Copper Wire and Cables, Benedict Nickel Tubing, Tobin Bronze
BRANCH MILLS:
AT WATERBURY, CONN.
Benedict & Burnham Branch
Waterbury Brass Branch
AT ANSONIA, CONN.
Coe Brass Branch
Ansonia Brass and Copper Branch
AT TORRINGTON, CONN.
Coe Brass Branch
AT KENOSHA, WIS.
Kenosha Branch

"Bridgeport"
BRASS ROD A free-cutting Brass Rod for screw machine work. It is straight and free from cracks.
Cuts easy—saves tools—greatly increases your production.
Immediate Shipments
BRIDGEPORT BRASS COMPANY, Manufacturers
BRIDGEPORT, - - - - CONNECTICUT

Established 1802 Cable address, "Scovill"
Scovill Mfg. Co.
WATERBURY, CONN.
BRASS ROLLING MILLS
WIRE MILLS
FACTORIES for the manufacture of various articles made of brass or German Silver
DEPOTS:
NEW YORK - BOSTON - CHICAGO

Hendricks Brothers
Manufacturers of
Sheet and Bar Copper
COPPER FIRE BOX PLATES and STAYBOLTS
WIRE and BRAZIER'S RIVETS
Importers and Dealers in
INGOT COPPER, BLOCK TIN, SPELTER, LEAD, ANTIMONY, BISMUTH, NICKEL, Etc.
49 Cliff Street New York

NON-CORROSIVE FINEST QUALITY
Copper and Yellow
(MUNTZ) METAL
NAVAL BRASS
NAVAL BRONZE
MANGANESE BRONZE
PLATES, SHEETS, BOLTS, BARS, RODS, NAILS, TACKS, ETC.
Taunton - New Bedford Copper Co.
NEW BEDFORD, MASS.
35 Howard Street New York
61 Batterymarch Street Boston

The National Brass and Copper Company
Manufacturers of
HIGH GRADE CLEAN and BRIGHT
SHEET, PLATE and ROLL
Copper
ALL GAUGES and FINISHES
ASK FOR PRICES
QUICK SHIPPERS
LISBON - - OHIO

C. G. Hussey & Co.
PITTSBURGH, PENNA.
Manufacturers of
COPPER
IN SHEETS, PLATES, ROLLS
ANODES
TACKS AND NAILS

Britannia Metal
CASTING, ROLLING and REFINING FOR THE TRADE
Standard Rolling Mills Inc.
363 Hudson Avenue
BROOKLYN, N. Y.

The Seymour Mfg. Co.
SEYMOUR, CONN.
Specializes in
German Silver
Pure Nickel SHEET AND WIRE
NICKEL ANODES
PHOSPHOR BRONZE

"RIVERSIDE"
GERMAN SILVER
PHOSPHOR BRONZE
Sheets, Rods, Wire, Ingots, Castings, Jewelers' Bars and Alloys
THE
Riverside Metal Co.
Riverside, Burlington Co., N. J.

MANUFACTURERS OF PLATE, SHEET, ROD, WIRE, TUBE, INGOTS, METAL GOODS

DIRECTORY

METAL ROLLING MILLS

MANUFACTURERS OF PLATE, SHEET, ROD, WIRE, TUBE, INGOTS, METAL GOODS

AMERICAN CUPRO-NICKEL CO.

ROLLING MILLS AT STAMFORD, CONN.

CUPRO-NICKEL or BRASS SHEET, STRIP, CUPS, DISCS, COPPER RINGS

NEW YORK SALES OFFICE

SUITE 3002, 120 BROADWAY 'PHONE "RECTOR 7010"

NICKEL AND COPPER PRODUCTS

The Sign of Quality

STAMFORD ROLLING MILLS CO. INC. STAMFORD SUPERIOR TOCK SPRINGDALE, CONN.

WE OFFER Brass Sheets, Strips, Cups or Discs—for Delivery 1916 - 1917 —at the Rate of

100,000 lbs. Daily

STAMFORD ROLLING MILLS CO., Inc.

Sales Office:

No. 25 Broad Street New York City

Phone 4783-84 Broad

A. H. Wells & Co.

WATERBURY, CONN.

Manufacturers of

SEAMLESS NICKEL SILVER BRASS, COPPER, BRONZE AND PURE COPPER **Tubing**

TUBING FOR ELECTRICAL PURPOSES

Odd and Special Shapes, and Small Tubing a Specialty

—Also the—

BOURBON STEAM GAUGE SPRINGS

All Sizes from 8 to 36, B. & S. Gauge

Rome Hollow Wire & Tube Company

Main Office and Mill,
ROME, N. Y.

Manufacturers of

SEAMLESS BRASS AND COPPER TUBING

Making a specialty of the smaller sizes and thin gauges

THE NATIONAL COMPANY

WATERBURY, CONN.

Manufacturers of

SEAMLESS TUBING

Silver Chloride **Jackson's** Silver Nitrate

Sterling **FIRELESS** Silver

Silver Anodes, Silver Wire, Silver Solders, Granulated Silver and Pure Shot Copper. Sweeps Refined.

JOHN J. JACKSON COMPANY

156-158 ASTOR ST. NEWARK, N. J.

Manhattan Brass Company

332 East 28th St., NEW YORK CITY

Manufacturers of

BRASS and BRONZE in Sheets, Rod, Wire, Tube, Moulding, etc. METAL GOODS made to order from Brass, Bronze and Copper.

BRASS and COPPER in Sheets and Rolls

SILVER PLATED METAL (for Coach Lamps)

BRITANNIA METAL

B. & M. BABBITT METAL for Bearings

LINING METAL for Automobile Bearings and Copper for Electrical Purposes

H. K. & F. S. Benson

GLEN RIDGE, N. J.

THE PILLING BRASS CO.

WATERBURY, CONN.

Manufacturers of

ROLLED BRASS, BRONZE, GERMAN SILVER AND COPPER IN THIN GAUGES, PLATERS' METAL

SPACE FOR SALE

Send for Rates

THE METAL INDUSTRY DIRECTORIES

are a means of putting your name and products before the entire metal industry each month at a very small cost. They reach over 6,000 consumers every month. In no other way can you get such good trade publicity at so slight a cost.

THE METAL INDUSTRY, 99 John Street, New York

STEEL AND ZINC SHEETS COATED WITH BRASS, COPPER, TIN NICKEL, ETC.

DIRECTORY

MANUFACTURERS OF PLATED SHEET METALS

STEEL AND ZINC SHEETS COATED WITH BRASS, COPPER, TIN NICKEL, ETC.

NATIONAL SHEET METAL COMPANY

Manufacturers of

NICOLINE, Brassene, Copperene and Bronzene. Nickel Tin, Brass Tin, Bronze Tin, and Copper Tin. Sheet Zinc, polished.

Large Saving to Manufacturers

Last Year's Sales 1,500,000 lbs.

For further information Address office, PERU, ILLINOIS

PLATED SHEET METALS

Nickel Tin Plate — Nickel Zinc
Copper Tin Plate — Copper Zinc
Oxidized Tin Plate — Polished Zinc

HIGHEST QUALITY. QUICKEST FACTORY SHIPMENTS

Apollo Metal Works - - La Salle, Ill.

AMERICAN NICKELOID CO. Office, Peru, Illinois

FIRM OF R. ROTHSCHILD, EASTERN SALES AGENTS, 207 NORMAN AVE., BROOKLYN, N. Y.

Highest quality of plated Sheet Metal, Sheet Zinc and Tin Plates coated with Nickel, Brass, Copper, etc.

The first mill in America to make Nickeled Sheet Zinc. Established 1898

PRODUCERS OF PIG LEAD, SLAB SPELTER, SHEET ZINC, ROD, ACIDS

DIRECTORY

LEAD AND ZINC SMELTERS AND MANUFACTURERS

PRODUCERS OF PIG LEAD, SLAB SPELTER, SHEET ZINC, ROD, ACIDS

INTERNATIONAL LEAD REFINING CO.

PIG LEAD

Refinery: EAST CHICAGO, INDIANA

Sales Agents

UNITED METALS SELLING CO.

42 Broadway, New York

Illinois Zinc Company

Manufacturers of

SPELTER, SHEET ZINC, and SULPHURIC ACID

PERU, ILL.

W. FISHER

Agent, 81 and 83 Fulton Street
New York City

Telephone, 139 Beekman

Selected Spelter and Sulphuric Acid

THE HEGELER ZINC COMPANY

(SUCCESSORS TO HEGELER BROTHERS)

DANVILLE, ILL.

Matthiessen & Hegeler Zinc Co.

LA SALLE, ILLINOIS

SMELTERS OF SPELTER

and Manufacturers of

SHEET ZINC and SULPHURIC ACID

Zinc for Leclanche Battery

Special Sizes of Zinc to order. Rolled Battery Plates. Selected Plates for Etchers' and Lithographers' use. Selected Sheets for Paper and Card Makers' Use. Stove and Washboard Blanks.

SPELTER

for all purposes, including the standard

High Grade Brands:

"Horse Head" and "Bertha"

The New Jersey Zinc Company

Room 516, 55 Wall St., N.Y.

Sulphuric Acid — Spiegeleisen
Lithopone — Zinc Oxide — Zinc Dust

COLD ROLLED ZINC

IN COILS FOR

DRAWING and STAMPING

THE PLATT BROS. & CO.

WATERBURY, CT.

This Space For Sale

Send for Rates

Sandoval Zinc Company

Smelters of

High Grade Spelter and Pig Lead

Chemical Department
East St. Louis
General Offices
410 North Peoria Street
CHICAGO, ILLS.

Works: Sandoval and East St. Louis, Illinois

PRODUCERS ALSO BUYERS AND SELLERS OF NEW AND OLD METALS

DIRECTORY

METAL SMELTERS, REFINERS, DEALERS

PRODUCERS ALSO BUYERS AND SELLERS OF NEW AND OLD METALS

UNION SMELTING & REFINING COMPANY, Inc.

SMELTERS AND REFINERS OF DROSSES, SCRAP WHITE METALS, ETC.

WHITE METAL ALLOYS

SOLDER, ALL FORMS
WIRE SOLDER
SPELTER OR BRAZING SOLDER

BABBITT METAL, ALL GRADES
TYPE METALS

LEAD PIPE
TIN PIPE
WHITE METAL SHEETS

BALTIMORE OFFICE AND WORKS:
805 SOUTH WOLFE STREET, BALTIMORE, MD.
(Formerly Brooks Solder & Metal Works)

MAIN OFFICE AND WORKS:
14th STREET AND AVENUE D, NEW YORK

Balbach Smelting & Refining Co.

NEWARK, NEW JERSEY

PURCHASERS OF

COPPER BEARING MATERIAL

A superior market offered for all kinds of Residue and Scrap Materials containing copper in any form

LEAD BEARING MATERIAL

Battery Plates, Sediment, Sulphates, Drosses, etc.

(Cable Address "BALBACH")

Established 1789

NATHAN TROTTER & CO.

Pig Tin	Shot Nickel	Ingot Copper
Pig Lead	Cube Nickel	Antimony
Spelter	Ingot Aluminum	Bismuth

36 No. Front St.
PHILADELPHIA, PA.

Columbia Smelting & Refining Works

365 West Street, New York

METAL ALLOYS ACCORDING TO YOUR OWN FORMULAE

WHITE METALS A SPECIALTY

Tell us your wants or send us your samples for analysis. We will quote you most attractive prices.

WE HAVE PERFECT FACILITIES FOR ANALYSES

C. W. LEAVITT & CO.

1812 Hudson Terminal Building
NEW YORK

Headquarters for: MAGNESIUM METAL, ANTIMONY and other

METALS & ALLOYS

We also solicit your inquires for BRASS in all forms.

WE SPECIALIZE IN

Monel Metal Scrap and Turnings. Nickel Anode Scrap, Dust and Sediment. Plated Brass and German Silver Spoons, Forks, Knives, Bell Metal Scrap. Mercury.

WE SELL SHOTTED NICKEL

Mention this paper

E. M. MOERS' SONS

183 SOUTH STREET NEW YORK

Illinois Smelting & Refining Co.

Peoria and Kinzie Sts., Chicago, Ill. Cable Address, "Smelref," Chicago

Manufacturers of

Spelter, Pig and Bar Lead, Copper, Red Brass and Yellow Brass, Composition Metals, Babbitt Metals of All Kinds, Stereotype, Monotype and Electrotype

Dealers in New and Old Metals, and the Largest Buyers of Zinc Dross, Skimmings, Sal Skimmings, Scrap Zinc and Aluminum

CAPPER PASS & SON, LD.

BRISTOL, ENGLAND

ARE BUYERS OF

Ores, Mattes, Drosses or Residues

CONTAINING

Tin, Copper, Lead and Antimony.
Send samples or analysis.
Cable address—Pass, Bristol.

CASH PAID FOR SECOND-HAND MATERIALS

Platinum, Silver, Quicksilver, Bismuth, Nickel, Magnesium, Cadmium, Gas Mantle Dust, Ores and Chemicals, and all similar goods

JOSEF RADNAI 36 Fulton Street, New York City

THIS SPACE FOR SALE

SEND FOR RATES

S. BIRKENSTEIN & SONS

379-407 W. Ontario Street, Chicago, Ill.

Lake, Electrolytic and Casting Ingot Copper

PRODUCERS ALSO BUYERS AND SELLERS OF NEW AND OLD METALS

DIRECTORY

METAL SMELTERS, REFINERS, DEALERS

PRODUCERS ALSO BUYERS AND SELLERS OF NEW AND OLD METALS

Service: The Modern Asset

HAIR line dealings—cutting corners—or any other practice that means anything less than a fair deal, are no part of our business system. Service—satisfaction to the customer—is the great idea around which our business methods revolve. To sell a customer once does not mean anything, but to make a continuons purchaser of a new patron means everything in building a business and insuring its future. Consult

WHITE & BRO., Inc.
Philadelphia

RED AND YELLOW INGOT BRASS

WHIPPLE & CHOATE
429 Iranistan Ave., Bridgeport, Conn.

DIRECTORY

METAL FOUNDERS, FINISHERS, WORKERS AND SPECIALTY MANUFACTURERS

THE ENTERPRISE MANUFACTURING CO.

Established 1881
Paid in Capital, $425,000 Dept. 41

AKRON, O.

CONTRACT MANUFACTURING
IN METAL GOODS

SPECIAL PARTS TO ORDER. METAL STAMPINGS, WIRE FORMING AND POINTING

SCREW MACHINE PRODUCTS
EXPERT DIE MAKERS

BUFFING, POLISHING, PLATING
AND SPECIAL FINISHES

NOTICE
Estimates cheerfully furnished on receipt of drawings, specifications or samples—the latter preferred.

AUTOMOBILE BRAND

THE best of materials, an up-to-date plant and our long experience give superiority to

"Automobile Brand Castings" in Aluminum, Manganese Bronze, Phosphor Bronze, Red and Yellow Brass and Bearing Metals.

Also to our *"Quality" Die Castings* in high-grade alloys

Our Aluminum Castings are especially well adapted to automobile, motor-boat and aerial construction.

Light Mfg. & Foundry Co.
Pottstown, Pa., U. S. A.

LESTER H. VAUGHAN, Specialist in

DIFFICULT AND EXTRA FINE

METAL SPINNING
Experimental Work, etc.

AT VERY REASONABLE RATES

8 W. Britannia Street Taunton, Mass.

"DOEHLER" DIE-CASTINGS

The Best Made

¶ For accuracy and uniformity "Doehler" Die-Castings are unsurpassed. Judge them by the companies that use them.

WRITE FOR OUR NEW BOOKLET

Doehler Die-Casting Co., Brooklyn, N.Y.
Western Plant : : : : : Toledo, Ohio

Grommets and Washers
PERFORATED BRASS
EVERYTHING IN BRASS AND COPPER
EDWIN B. STIMPSON COMPANY
PERFORATED COPPER
Eyelets for all Purposes

Edwin B. Stimpson Company

70 FRANKLIN AVENUE, BROOKLYN, N.Y.

PINS, BRADS, NAILS, TACKS, RIVETS
In Brass, Copper and German Silver

DIRECTORY

METAL FOUNDERS, FINISHERS, WORKERS AND SPECIALTY MANUFACTURERS

ACME DIE-CASTINGS

Finish and Accuracy

Acme Die-Castings appeal most strongly to old users. Our most enthusiastic customers are men who have used die-castings from various sources for years. The finish, accuracy and thoroughness of our work is appreciated by them because they have a standard of comparison based on long experience. *know.*

Metals

Break an Acme die-casting and note its toughness and strength, the velvety solid grain of the metal. Our metals are produced in our own laboratory of the finest materials. They will do what we claim for them.

Cost

High grade die-castings and efficient service do not and *should not* cost more than mediocre castings and poor service. Doing the thing right is, after all, the cheapest way in our business. For that reason you will find our prices low.

Get our figures and put us to the proof

ACME DIE-CASTING CORP.

BUSH TERMINAL, 35th Street and Third Avenue, BROOKLYN, N. Y.

Electro Plating For Others Our Specialty

All the finishes in NICKEL, BRASS AND COPPER PLATING, also BUFFING, POLISHING, LACQUERING, OXIDIZING AND METAL STAMPING.

We will be glad to quote prices on receipt of samples.

The C. J. ROOT COMPANY, BRISTOL, CONN.

Practical Electro-Plating

By W. L. D. BEDELL.

5½ x 8 inches; 244 pages; 110 illustrations, $2.00. Including a year's subscription to THE METAL INDUSTRY, $2.50.

The Metal Industry, 99 John St., New York

MOULDMAKER

Specialist for Soft Metal Moulds

G. KELCH, 145 East 23rd St., New York

ENGINEERS' CHEMISTS METALLURGISTS

DIRECTORY

LABORATORIES AND PROFESSIONAL MEN

ENGINEERS CHEMISTS METALLURGISTS

LEDOUX & COMPANY

NEW YORK

Laboratory and Office: 99 John Street

Specialists in Analyses of Metals and Alloys

W. A. WOOD

Engineer

120 Broadway New York

Designer and Builder of Brass and Copper Rolling Mills. Sheet, Rod, Wire Tube Extrusion Process. Furnaces, Automatic Machinery

Complete plants built and operated

E. BLASSETT, Jr.

Address, care The Metal Industry 99 John St., New York

Consulting Electro-Plater

Expert on Special Finishes for Steel and Iron

GUN METAL, BLACK NICKEL, RUST-PROOFING, ETC.

Formulas and instruction in all processes of plating, metal coloring, dipping and lacquering.

R. A. WOOD - Cheshire, Conn.

Author of The Waterbury Book of Alloys

New York Address, Care The Metal Industry, 99 John Street

PRACTICAL CONSULTING EXPERT on the CASTING and WORKING of BRASS and COPPER ROLLING MILL ALLOYS

THIS SPACE FOR SALE

SEND FOR RATES

JOHN M. McLACHLEN

Attorney at Law

PATENTS and TRADEMARKS

UNION TRUST BUILDING

WASHINGTON, D. C.

ANALYSES, ETC. DOVER LABORATORY, DOVER, N. J.

SPACE FOR SALE SEND FOR RATES

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

TRADE WANTS

RATES:—40 CENTS PER LINE; THREE LINES ONE DOLLAR, PER INSERTION; EXCEPT SITUATIONS WANTED, WHICH ARE 50 CENTS PER INSERTION. DISPLAY ADS. $3.00 PER INCH, PER INSERTION. ANSWERS SENT CARE THE METAL INDUSTRY WILL BE FORWARDED.

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

FOR SALE—EQUIPMENT, ETC.

SECOND HAND MACHINERY

FOR SALE—The following second hand machinery:

1—No. 4000 Watt, Hanson & Van Winkle 3 Wire Plating Dynamo.
6—Bench Buffing Machine Exhaust System.
1—No. 378 Hanson & Van Winkle Plating Barrel.
4—No. 6 Band Iron Tumbling Barrels.
1—Wood Tumbling Barrel.
1—Double American Gas Hardening Furnace.
1—No. 15 Frankford Oil Tempering Furnace.
1—Double Galvanized Enameling Oven.
1—40" No. 8 Buffalo Cupola and Forge Blower.
1—No. 16 American Gas Furnaces.
1—Emery Wheel Stand (12" wheels).

All above in first class condition.

THE ENTERPRISE MANUFACTURING CO., AKRON, OHIO.

MOLDING MACHINES

FOR SALE—Ten Type T International Stripping Plate Molding Machines 12" x 12" x 5¼". Used only two months. Address

THE FAIRBANKS COMPANY,
BINGHAMTON, N. Y.

STEAM ENGINE

FOR SALE—CORLISS STEAM ENGINE, 275 H. P.; gas or gasoline engine, 110 H. P., and Ball automatic steam engine, 25 H. P. All in first class condition. Particulars. Address

NATIONAL ALUMINUM WORKS, Elmira, N. Y.

PLATING PLANT

FOR SALE—Large modern job plating plant, established 21 years. Cleared better than $4000 this year. Will sell at invoice (about $4000). Good reason for selling. Chance of a lifetime. Address

D. B. H., 215 East 11th Street, Indianapolis, Ind.

USED BUFFS

FOR SALE—About 2000 sections used muslin buffs, whole piece and stitched, 6" to 8" diameter, 1" hole, about 24 ply. Make us an offer. Want to clean out before inventory. Address

SPEAKMAN SUPPLY & PIPE COMPANY,
WILMINGTON, DELAWARE.

PLATING AND COLORING SHOP

FOR SALE—Plating and Coloring business in jewelry centre of Providence. A growing business, employing help and showing a profit. Satisfaction will be given. This is a good investment for a quick buyer. Price $1,000, part can remain, or what will you offer? Address

OPPORTUNITY, care THE METAL INDUSTRY.

PLATING DYNAMOS

FOR SALE—One World Plating Dynamo, 4 volt, 400 amp. Three World Plating Dynamos, 7½ volt, 700 amp. One Hanson & Van Winkle Dynamo, 8 volts, 1500 amp. All in good condition. Address

BELZ-DUNCAN COMPANY,
14 SOUTH 5TH ST., PHILADELPHIA, PA.

OPERATING PLANT AND MACHINERY

FOR SALE—An operating plant and machinery. Well equipped and suited for manufacturing war materials, such as guns, bayonets, small shells, etc. Full information on request to P. O. Box H-453, ERIE, PA.

FOUNDRY EQUIPMENT

FOR SALE—The following Foundry Equipment:

Item No. 1. Three Bridgeport Squeezing Machines.
One Pneumatic Squeezer Table 16" x 26.
Cylinder No. 146
Frame No. 516
One Pneumatic Squeezer Table 16" x 26.
Cylinder No. 141
Frame No. 515
One Pneumatic Squeezer Table 15¼" x 24.
Cylinder No. .....(not given)
Frame No. 519
Item No. 2. One Paxson Sand Blast Machine, 20 x 48 cylinder.
Item No. 3. One W. S. Rockwell Tilting Brass Furnace No. 2, capacity 400 lbs. per heat, first class condition.
Item No. 4. Four Schwartz Hawley Down Draft brass melting furnaces. CHEAP. Immediate shipment, two each capacity 500 and 1,000 pounds of brass per heat.
Item No. 5. Backus Gas Engine, 35 H. P., first class condition. Size balance wheels 4⅝" x 68". Size belt wheel 14" x 36", cylinder 12 x 17.

Address

FOUNDRY EQUIPMENT, care THE METAL INDUSTRY

METAL SPINNING EQUIPME T

FOR SALE—Spinning Lathes, Buffing and Polishing Lathes, Annealing Oven, Scrap Baler, Vises, Pulleys and Belting. Address

NEWARK REFLECTOR DIVISION,
NEWARK, OHIO.

BRASS TUBING

FOR SALE—At a bargain, 100 ft. (about 275 pounds), solid drawn brass tubing, 2⅛ in. O. D., 1⅞ in. I. D., in 6 ft. lengths. Address

HEITGER CARBURETER COMPANY,
1129 Beecher Street, INDIANAPOLIS, IND.

UNITED STATES PATENT

FOR SALE—United States patent granted June 1st, 1915. Patent number 1,141,734. On sanitary cuspidor. It can be made in any kind of metal. Cast, spun or stamped. Will keep a plant busy in itself. Nothing on the market like it. Address

SAMUEL O. WALTERS, Royersford, Pa., or his attorney,
HARRY J. HIERSTAND, 323 Swede Street, Norristown, Pa.

BOUND VOLUMES

FOR SALE—We have for sale the following complete volumes of THE METAL INDUSTRY: 1—1904, 1—1905, 2—1906, 2—1907, 2—1908, 2—1909.

THE METAL INDUSTRY, 99 John Street, New York

WIPING RAGS AND WASTE

WALSH'S SONS & CO. NEWARK, N. J.
Old Material of All Kinds Bought and Sold.

FOR SALE—Modern equipped plating plant. Other business opportunities demands our entire attention. It will pay you to investigate. Address REX JOBBING COMPANY, 64 Second avenue, Detroit, Mich.

HAVE YOU A WANT?
Satisfy it by advertising in THE METAL INDUSTRY.

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

TRADE WANTS

RATES:—40 CENTS PER LINE; THREE LINES ONE DOLLAR, PER INSERTION; EXCEPT SITUATIONS WANTED, WHICH ARE 50 CENTS PER INSERTION. DISPLAY ADS. $3.00 PER INCH, PER INSERTION. ANSWERS SENT CARE THE METAL INDUSTRY WILL BE FORWARDED.

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

WANTED—EQUIPMENT, ETC.

MELTING FURNACE

WANTED—Second-hand Hawley Schwartz down draft furnace. Must be cheap for cash. Address
MAXWELL ENGINEERING COMPANY,
Rome, N. Y.

TILTING FURNACE

WANTED—A Second Hand Tilting Furnace for Melting Brass. Address with full particulars,
TILTING FURNACE,
Care THE METAL INDUSTRY.

POLISHING WHEELS

WANTED—To buy second hand Polishing Wheels of bull neck flat wood wheels, leather faced, 12" diameter up to 2½" face, 1" arbor. Address
WHEELS, Care THE METAL INDUSTRY.

SECOND HAND FURNACE

WANTED—To buy second hand Schwartz furnaces, give full particulars, condition, bottom price.
Address FURNACES,
Care THE METAL INDUSTRY.

MULTIGRAPH MACHINE

WANTED—A Second-hand Multigraph Machine in first class order. Address
MULTIGRAPH MACHINE,
Care THE METAL INDUSTRY.

PARTNER IN PLATING BUSINESS

WANTED—An Experienced Plater with small capital to take charge of a Plating Shop in Western City. Population fifty thousand. For further particulars,
Address PLATING PARTNER,
Care THE METAL INDUSTRY.

SATISFY YOUR WANTS
BY ADVERTISING THEM IN
THE METAL INDUSTRY

WHITE METAL EXPERT

WANTED—To correspond with a man who thoroughly understands the refining and smelting of white metals. Address
WHITE METALS,
Care THE METAL INDUSTRY.

INQUIRIES AND OPPORTUNITIES

Inquiries received by The Metal Industry for Metals, Machinery and Supplies. Further particulars may be obtained by addressing the inquiry number, care The Metal Industry. No charge for inserting these inquiries.

Inquiry 1259—We are interested in machinery to produce shot that averages about 5 or 6 pounds to 250 pieces. Who makes such machinery?

Inquiry 1260—Who makes "Aero" metal?

Inquiry 1261—Through a bookshop here in Sweden we are subscribers to your valued journal. Can you assist us by giving us the addresses of firms in America that drophammer table knife material?

Inquiry 1262—We desire to locate a plating establishment that can plate 12 ounce copper belts 27 inches wide and 153 feet 6 inches long.

Inquiry 1263—Kindly send us the names of firms from whom we can buy hollow ferrules, sometimes called eyelets.

Inquiry 1264—Can you give us the names of the manufacturers of small savings banks for children, that operate something like a cash register?

Inquiry 1265—Could you supply me with a list of automatic buffing and polishing machine manufacturers?

Inquiry 1266—I am in the market for tin shop outfit. I have put in my brass shop and will put in a small machine shop and iron foundry at once.

Inquiry 1267—Can you send us the names of concerns, preferably in the East, who furnish aluminum castings to special order? We have a cast aluminum tea pot spout which we want duplicated.

Inquiry 1268—Where can we obtain steel barrels?

Inquiry 1269—Where can we have brass wire tin plated?

Inquiry 1270—Please let me know who imports French bronze colors and bronzes. Do you know of a varnish called Chennelle?

Inquiry 1271—Where can we obtain a small plate or anode of cobalt for experimental purposes?

Inquiry 1272—We contemplate installing a small nickel plating plant and would appreciate it if you will put us in touch with reliable concerns who can give us information and prices on equipment.

Inquiry 1273—Can you give us information as to who makes circular plating tanks, of which we understand there are several varieties in use.

Inquiry 1274—Can you tell us who manufactures machinery for making cartridges?

Inquiry 1275—We have quantities of silver that has been reduced in hypo solution in the manufacture of moving picture films. What is its value?

Inquiry 1276—Where can we secure bronze powder for use in electro-deposition of copper on non-metallic surfaces?

Inquiry 1277—We want a lathe or machine that will reproduce sockets for artificial limbs from plaster casts of the amputation.

Inquiry 1278—We want to purchase a press that will blank metal 6½" diameter and ⅛" thick. It must positively be equal to this work.

SITUATIONS OPEN

ROLLING MILL HELP

WANTED—Our Modern Brass Rolling Mills at Stamford, Conn., will be in operation in January. We want to surround ourselves with the best organization possible. We are now ready to hire a good Superintendent, Chemist, and Casters, Rollers, etc. All applications strictly confidential. Address
AMERICAN CUPRO-NICKEL COMPANY,
120 BROADWAY, Suite 3002, NEW YORK CITY.

BRASS FOUNDRY FOREMAN

WANTED—A Brass Foundry Foreman; one who is familiar with Plumbing Supplies. Must be up to date on match plates and moulding machines, mixing metals and get out production at minimum cost. In reply state experience, salary expected and give reference. Address
FOUNDRY FOREMAN, care THE METAL INDUSTRY.

SUPERINTENDENT

SITUATION OPEN—Superintendent for a plant manufacturing high grade plumbers and corporation brass goods. State experience, age, habits and salary. Address
SUPERINTENDENT,
care THE METAL INDUSTRY.

FACTORY INSPECTOR

WANTED—Inspector for factory making small motors, to inspect all purchased material; experienced in inspecting metal parts, wiring and insulating material, metal stock supplies. State age, nationality, experience, places and periods of former employment, wages expected. Applications without statements required cannot be considered. Address,
MATERIAL INSPECTOR, P. O. BOX V., PLAINFIELD, N. J.

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

TRADE WANTS

RATES:—40 CENTS PER LINE; THREE LINES ONE DOLLAR, PER INSERTION; EXCEPT SITUATIONS WANTED, WHICH ARE 50 CENTS PER INSERTION. DISPLAY ADS. $3.00 PER INCH, PER INSERTION. ANSWERS SENT CARE THE METAL INDUSTRY WILL BE FORWARDED.

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

SITUATIONS OPEN—Continued

METAL MAN

WANTED—Experienced man, thoroughly efficient in the resmelting of aluminum, brass and copper scrap, and the mixing of alloys. All communications considered confidential. Address
R. L. M., Care THE METAL INDUSTRY.

FOREMAN PLATER

WANTED—A Foreman Plater to take charge of large Job Plating Shop in the South, doing all kinds of plating. Must be able to make and take care of solutions. Good position to right party. Address
SOUTHERN, Care THE METAL INDUSTRY.

BRAZING SPELTER MAKER

WANTED—A man fully capable to manufacture Brazing Spelter. Good position and pay for the right party. Address SPELTER MAKER,
Care THE METAL INDUSTRY.

POLISHER ON PLUMBING WORK

WANTED—A Polisher experienced on Plumbing Work. References. Factory in Massachusetts. Address POLISHER,
Care THE METAL INDUSTRY.

PLATER

WANTED—A Plater experienced on Metal Novelties and Bag Frames in high grade finishes. Must be able to make solutions. Address
BOX 12, Care THE METAL INDUSTRY.

HAVE YOU A WANT?
Satisfy it by advertising in
THE METAL INDUSTRY

SITUATIONS WANTED

Undisplayed Advertisements Under This Heading 50 Cents Each Insertion
Displayed Advertisements $1.50 per inch each insertion. Ads under this heading are payable in advance.

EXECUTIVE

SITUATION WANTED.—As Superintendent of Brass Plant manufacturing valves, plumbers' supplies and engineers' supplies. Have had 10 years' experience as Superintendent and understand the business from start to finish. 42 years old. Can give references as to ability and character. Would like to hear from a concern in need of a first-class man. Address BRASS GOODS, care THE METAL INDUSTRY.

SITUATION WANTED—Position as Manager or Superintendent of brass manufacturing plant. Experienced on hardware, plumbers' supplies, novelties, etc. Executive, married, sober, 34 years old, technical graduate, hustler; modern methods, up-to-date in every way. Now employed, but desires to connect with a growing concern, where ability is appreciated and rewarded. Address ABILITY, care THE METAL INDUSTRY.

SITUATION WANTED—By an executive young man 28, five years in present position as assistant to executive, having charge of accounting, purchasing and shipping department, firm doing all high grade repairing and replating Hotel Silverware and General Plating Work, desires to change about December 1 to take full charge or as assistant to manager, purchasing agent, shipping department or office. Knowledge of credits and collections; Excellent references. Locality immaterial. Address EXECUTIVE, care THE METAL INDUSTRY.

METALLURGICAL CHEMIST

SITUATION WANTED.—A Chemist and Metallurgist having a wide experience in laboratory and foundry practice, desires to make a change. Is expert in the mixing, melting and heat treatment of copper and brass and other metals. Advertiser is a College Graduate and can furnish best references. Address GRAPHO, care THE METAL INDUSTRY.

SALESMEN

SITUATION WANTED—As salesman, American, 28, single. Special training along chemical lines in plating, japanning and enameling (porcelain, oils, etc.), tinning and galvanizing. Ability and varied experience. Good references. Now in responsible executive factory position in Brooklyn. Can sell machinery, tools, chemicals, factory supplies and specialties of all kinds. Good references. Address CHEMICAL LINES, care THE METAL INDUSTRY.

SITUATION WANTED—Practical plater and chemist wants place as salesman; large experience. Well trained in variety of lines. Now in large metal working plant in important and responsible position. Young, energetic and single; American. Good salary wanted, which will be earned. References. Address PLATING SALESMAN, care THE METAL INDUSTRY.

DESIGNER

SITUATION WANTED—By a Draftsman and Designer experienced on Chandelier Work. Desires to connect with some reliable Chandelier Manufacturer or any other line. Prefers to locate outside of New York City. Address DESIGNER, care THE METAL INDUSTRY.

MODELER AND CHASER

SITUATION WANTED—Modeler, Chaser and Draftsman looking for position in bronze works. Two and one-half years in New York doing architectural bronze work. Expert on figures and ornaments. Best of references. Address BRONZE WORKER, care THE METAL INDUSTRY.

FRENCH MOULDER

SITUATION WANTED.—French moulder, ex-foreman of large Art Bronze Foundry in Paris, desires position. Can accomplish rapidly the most difficult works in statuary—ornament—architecture. Would accept contract. Thoroughly reliable. Speaks little English. Address FRENCH MOULDER, care THE METAL INDUSTRY.

MOLD MAKER

SITUATION WANTED—By a mold maker of 20 years' experience designing and modeling trimmings for britannia hollow ware, chasing and fitting moulds and dies for same. A-1 on toilet ware dies and forces. Address MOULD MAKER, care THE METAL INDUSTRY.

FOUNDRYMAN

SITUATION WANTED—Position as Brass Foundry Foreman. Good, practical qualifications on faced work, green and dried. Address B. F. F., care THE METAL INDUSTRY.

HOT GALVANIZER

SITUATION WANTED—As SUPERINTENDENT or FOREMAN of JOB GALVANIZING WORKS. 25 years' experience in handling men, installing plants and latest appliances for small work—tacks, nails, screws, etc., and in practical galvanizing "Hot Dipping." Thorough knowledge of the business and details. Address GALVANIZING FOREMAN, care THE METAL INDUSTRY.

PLATERS AND POLISHERS

ELECTRO-PLATERS

Any one desiring the services of first class men for the electro-deposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the American Electro-Platers' Society,

WALTER FRAINE,
507 GRAND AVENUE, DAYTON, OHIO.

SITUATION WANTED.—Foreman Plater wishes position. Understands all kinds of Plating and Polishing. Can mix all kinds of plating solutions and correct old ones. Understands all kinds of Lacquer finishes. Address LOUIS KLEIN, 1165 Bryant avenue, Bronx, New York City.

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

TRADE WANTS

RATES:—40 CENTS PER LINE; THREE LINES ONE DOLLAR, PER INSERTION; EXCEPT SITUATIONS WANTED, WHICH ARE 50 CENTS PER INSERTION. DISPLAY ADS. $3.00 PER INCH, PER INSERTION. ANSWERS SENT CARE THE METAL INDUSTRY WILL BE FORWARDED.

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

SITUATIONS WANTED—Continued

PLATERS AND POLISHERS—Continued

SITUATION WANTED—HOLLOW WARE—By an experienced plater, on all grades of table hollow ware. Thorough in all branches in the plating room. Address HARTFORD, care THE METAL INDUSTRY.

SITUATION WANTED.—Foreman Plater and Metallizer. Eighteen years' experience, A-1 references. Thoroughly experienced in metallizing on all kinds of statues, book ends, lighting fixtures, architectural and wood work. Understands dry oxidizing in all colors on calamine work. Address Henry Blackstein, 154 Second avenue, New York, N. Y.

SITUATION WANTED—Foreman Plater wishes position. Can take charge of plating and polishing departments. Good references. Prefer position in New York City or vicinity. Address WORKMAN, care THE METAL INDUSTRY.

SITUATION WANTED—By a plater who understands the plating, polishing, buffing, lacquering, oxidizing of metals. Can also Nickel Plate Sheet Zinc and Castings. Member of American Electro-Platers Society. Address O. A. F., care THE METAL INDUSTRY.

SITUATION WANTED—By an experienced Foreman Nickel Plater, having fourteen years' experience. Can make all solutions and all kinds of finishes. Can also do lacquering, barrel plating, ball burnishing and all kinds of tumbling, also grinding, polishing and coloring. Can furnish good references. Address P. M. PLATER, care THE METAL INDUSTRY.

SITUATION WANTED—By a Practical up-to-date Foreman Plater. Originator of the Process of Metalizing Lace, Plaster, Wood, etc., in all finishes. Can also plate on aluminum and all other metals, both hard and soft; also rubber, etc. Capable of installing up-to-date plants. Can furnish the best of references as to ability, etc. Address H. Keppler, 310 Bainbridge street, Brooklyn, N. Y.

SITUATION WANTED—By a Foreman Plater, not a self-styled expert, but a practical all-round man, 20 years' experience doing gold, silver, bright silver, nickel, black nickel, brass, bronze and copper plating, coloring, oxidizing and bronzing upon both soft and hard metals. Thoroughly experienced upon silverware, art metal novelties, ecclesiastical goods, casket hardware, builders' hardware, ornamental brass and iron, plumbing and bath room supplies and antimonial lead novelties. Familiar with salt water gilding, ormolu gold, French gray and mechanical plating. Am at present foreman of a large plating department. Can furnish high-grade references. For further information address HYDROPLASTIC, care THE METAL INDUSTRY.

SITUATION WANTED—By an A-1 Nickel Plater and Polisher, 12 years' experience in jobbing shop. Can furnish good reference as to ability, etc. Address NICKEL PLATER, care THE METAL INDUSTRY.

PLATERS AND POLISHERS—Continued

SITUATION WANTED—By a plater, married, 14 years' experience in all finishes in gold, silver, nickel, copper, brass, bronze, oxidizing, etc. Make all solutions. Have had a wide experience on various articles of manufacture. Steady and sober. Honest and reliable, quick worker. Will go anywhere, if permanent position. In reply, please give some details as nature of work, solutions, etc. A-1 references. Address PLATER, care THE METAL INDUSTRY.

SITUATION WANTED—Position as a plater; have had 20 years' experience as Foreman Plater in some of the largest plants in Connecticut doing gold, silver, nickel, brass, bronze, copper, tin, plating, oxidizing, coloring and lacquering on all metals; especially good on grays, French Bronzes and all of the late finishes. First class on German Silver and Britannia Metal, Hollow Ware. Can furnish best of references as to ability, etc. Address GERMAN SILVER, care THE METAL INDUSTRY.

SITUATION WANTED.—Foreman plater open for a position in or near Greater New York. Thoroughly up-to-date on all solutions and finishes, also mechanical plating and polishing. Can take care of polishing and lacquering. Would like to hear from some reliable chandelier or hardware concern desiring a reliable and steady man, have 22 years' experience in general plating. Can handle help to advantage and produce results. A1 references as to ability and sobriety, etc. Address S. Herrick, 137 Sixth street, Long Island City, N. Y.

SITUATION WANTED—Position as Foreman Plater, with 15 years' experience in executive positions in Nickel, Brass, Copper, Black Nickel and oxidizing. Can furnish best of references. Address NO-PEELING, care THE METAL INDUSTRY.

SITUATION WANTED—By a Foreman Plater. Can make all kinds of solutions and produce all finishes on hard and soft metals. Not afraid of work. Strictly temperate. Wages reasonable. Address F-1, care THE METAL INDUSTRY.

SITUATION WANTED—Position as Silver Plater on Steel Knives, German Silver Goods, etc. Latest methods in caring for solutions and Producing work. Address METHOD, care THE METAL INDUSTRY.

SITUATION WANTED.—Foreman Plater desires to make a change and would like to connect with reliable firm where the services of a competent man is indispensable. Not afraid of wages, work or location. Expert on all solutions and capable of maintaining normal conditions economically. Familiar with all popular and special finishes, all modern methods in connection with polishing, lacquering and barrel plating. Capable of installing plants. Can furnish A-1 references. Address Energetic, care THE METAL INDUSTRY.

BEFORE BUYING METALS, MACHINERY AND SUPPLIES, IT WILL PAY YOU TO LOOK OVER THE METAL INDUSTRY ADS—EVERY ADVERTISEMENT DESCRIBES SUITABLE METAL OR PLATING SHOP EQUIPMENT—ALSO IT WILL PAY YOU TO EXAMINE THE BUYERS' GUIDE TO ADVERTISERS' PRODUCTS AT THE BACK OF EACH ISSUE.

The METAL INDUSTRY For 1916

THE Best Writers in the World on Metallurgical, Mechanical and Chemical Subjects, relating to the metallic arts (not iron) will continue to write for THE METAL INDUSTRY.

Lists of articles that have been published in THE METAL INDUSTRY in past issues will be sent on request. Future issues will be larger, better, more interesting than ever.

The cost of a year's subscription is ONE DOLLAR to any address in the world.

THE METAL INDUSTRY
99 JOHN STREET ∴ ∴ NEW YORK

A PARTIAL LIST OF THE PRINCIPAL ARTICLES PUBLISHED IN THE METAL INDUSTRY DURING 1915

Article	Number
MANUFACTURING	
The Crucible Business (Continued)	January
The Influence of Style on the Art Metal Work of Modern Times (Continued)	"
The Crucible Business (Continued)	February
Small Aluminum Tubes	"
Die Castings	"
The Crucible Business (Continued	March
The Manufacture of Shrapnel	April
Modern Plating Department Order System	"
Safety in Foundry Operations (Continued)	May
The Manufacture of Cores	June
Safety in Foundry Operations (Continued)	"
A Brass Goods Manufacturing Plant	July
Safety in Foundry Operations	"
Factory Cost Accounting	"
The Influence of Style on the Art Metal Work of Modern Times	August
A Model Jewelry Factory	September
The "Wilzin Process" of Flatware Manufacture	"
The Manufacture and Uses of Wrought Manganese Bronze	October
The American Bronze Company's New Plant	November
Recent Developments in Aluminum	"
Collapsible Aluminum Cups	December
Percentage vs. Time Method of Applying Overhead Charges	"
METALLURGICAL	
A Note on the Annealing of Brass	February
Aluminum: Its Origin and Susceptibility	March
Titanium Aluminum Bronze	May
German Silver (Continued)	June
Heat Treatment of Copper and Brass	July.
The Refining of Zinc Waste	"
Fatigue of Copper Alloys	"
A Monel Metal Boat	August
Treatment of Waste Material Containing Silver	"
Copper Alloys with Notes on Brass Founding	"
German Silver	"
The Annealing of Brass Cartridge Cases	September
Spelter—Its Manufacture and Properties	"
Aluminum Die Casting a Commercial Achievement	October
Melting Aluminum Chips	October
Reclamation of Magnalium from Turnings	November
The Development of an Acid-Resisting Alloy	"
The Failure of Structural Brasses (Continued)	"
The Failure of Structural Brasses	December
CHEMICAL	
Preparation of Various Chemical Salts	January
The Testing of Electro-Plating Solutions	"
Determining Weight of Deposit (Continued)	April
Silver Solution Assay	"
Determining Weight of Deposit (Continued)	July
The Determination of Spelter Coating on Sheets and Wire	August
The Electrolytic Assay of Lead	November
Determining Weight of Deposit (Continued)	December
FOUNDING	
Brass Foundry Equipment and Management (Continued)	January
Precision Castings	"
Brass Foundry Equipment and Management (Continued)	February
Snap Flasks	"
Molding and Casting a Bronze Monument	March
Present-Day Aspects of English Foundry Practice (Continued)	"
Practical Suggestions for the Brass Foundry	"
The Foundry Use of Non-Ferrous Scrap Metals (Continued)	April
Standard of Classification for Old Metals	"
Present-Day Aspects of English Foundry Practice	"
Home-Made Molding Machines	"
Brass Foundry Equipment and Management (Continued)	May
The Treatment of Brass Foundry Sweepings	"
The Foundry Use of Non-Ferrous Scrap Metals	"
Efficiency in the Brass Foundry	August
Brass Foundry Profits	September
Functions of Sand Binder	October
Brass Foundry Equipment and Management	November
Ventilation of Foundries	December
MACHINING	
Rapid Working Methods in a Brass Manufacturing Plant	January
Die Holders	March
Lubricating Oils in the Metal Trades	May
How to Reduce Machine Friction	October
PLATING, POLISHING AND FINISHING	
Modern Plating Practice	January
Etching by the Transfer Process	"
Polishing Wheels (Continued)	"
Metal Coloring by the Corrosion Process	"
Some Methods Used by Platers to Produce Bright Nickel Deposits	February
Japanning, Its Origin and Development	"
Proper Use of Ammeter and Voltmeter in the Plating Room	"
The Control of Brass and Copper Plating Solutions	"
Copper Cyanide Plating Solutions	March
Abrasives (Continued)	"
Polishing Wheels (Continued)	"
Gold and Platinum Plating	"
Brass Finishing and Coloring	April
Abrasives	"
Preparation and Operation of all Lead Plating Baths	May
Keeping Cost in a Job Plating Shop	"
Removing Grease by Electricity	"
Electro-Plating with Cobalt	June
Cleaning and Plating in the Same Solution	"
The Successful Nickel Plating of Die Castings or Articles Made from Sheet Zinc	July
Polishing Wheels	"
A Simple and Successful Dip Gilding Solution	August
A Modern Piece Work System for a Large Plating Department	"
A Twentieth Century Electro-Plating Plant	"
Tumbling Barrel ("Jim Butler") Work	September
The Plating of the Troublesome Die-Castings	"
Polishing and Plating Room Practices Reviewed	October
Making the Silver Solutions	"
Polishing and Buffing	"
Grinding Wheels	November
Bronzing Processes Suitable for Brass and Copper (Continued)	"
Sherardizing	December
Copper Cyanide Solutions	"
Bronzing Process, Suitable for Brass and Copper	"

We have in stock Bound Volumes of The Metal Industry for the Years 1914, 1913, 1912, 1910. Price $1.50 per volume. Neatly bound in cloth and accurately indexed. The Metal Industry, 99 John St., New York.

The Metal Industry

IS THE MOST SUITABLE TRADE JOURNAL FOR ADVERTISING THE FOLLOWING:

Casting Metals and Alloys—New and Old.

Wrought Metals and Alloys, viz: Plate, Sheet, Rod, Wire, Tube.

All Kinds of Furnaces for Melting, Refining and Annealing Metals.

Molding Machines and Foundry Equipment for Molding Metals.

All Kinds of Machinery for Finishing Metal Castings, such as Turret Lathes, Engine Lathes, and Speed Lathes, etc.

All Kinds of Machinery for Forming Wrought Metals, such as Rolling Mills, Draw Benches, Power Presses, etc.

All Kinds of Grinding and Polishing Machinery, such as Grinders, Polishing Heads, etc.

Every Variety of Platers' and Polishers' Supplies, from Dynamos to Buffs.

In fact, every tool and supply that is used in a metal and plating shop can be advertised advantageously in

THE METAL INDUSTRY
99 JOHN STREET
NEW YORK

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Abrasives.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
Rhodes, James H., & Co., New York.

Accumulators, Hydraulic.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Acid, Hydrofiouric (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Cooper, Charles, & Co., New York.
General Chemical Co., Philadelphia, Pa.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch, Franklin H., Co., New York.
Munning-Loeb Co., Matawan, N. J.
Wiarda & Co., John C., Brooklyn, N. Y.

Acid, Muriatic (See also Platers' Supplies)
Apothecaries Hall Co., Waterbury, Conn.
Cooper, Charles, & Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
Niagara Alkali Co., Niagara Falls, N. Y.
Wiarda, John C., & Co., Brooklyn, N. Y.

Acid, Nitric.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch, Franklin H., Co., New York.
Munning-Loeb Co., Matawan, N. J.
Wiarda, John C., & Co., Brooklyn, N. Y.

Acid-Proof Stoneware.
German-American Stoneware Works, New York.

Acid, Sulphuric (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Cooper, Charles, & Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Hegeler Bros., Danville, Ill.
Illinois Zinc Co., Peru, Ill.
Kalbfleisch, Franklin H., Co., New York.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
Munning-Loeb Co., Matawan, N. J.
New Jersey Zinc Co., New York.
Wiarda, John C., & Co., Brooklyn, N. Y.

Air Brushes, Filters and Accessories.
De Vilbiss Mfg. Co., Toledo, O.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Eureka Pneumatic Spray Co., New York.
Paasche Air Brush Co., Chicago, Ill.

Air Compressors.
De Vilbiss Mfg. Co., Toledo, O.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Eureka Pneumatic Spray Co., New York.
General Electric Co., Schenectady, N. Y.
Leiman Bros., New York.
Paasche Air Brush Co., Chicago, Ill.

Alloys (Carbon Free).
Goldschmidt Thermit Co., New York.

Alloys Made to Specifications.
Ajax Metal Co., Philadelphia, Pa.
American Manganese Bronze Co., Philadelphia, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Columbia Smelting & Refining Works, New York.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Genesee Metal Co., Rochester, N. Y.
Goldschmidt Thermit Co., New York.
Lang, R. F., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Titan Metal Co., Bellefonte, Pa.

Aluminum Alloys.
Aluminum Co. of America.
Birkenstein, S., & Sons, Chicago, Ill.
British Aluminum Co., Ltd., New York and Toronto.
Electric Smelting & Alum'n Co., Lockport, N. Y.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
United Smelt. & Aluminum Co., New Haven, Conn.
U. S. Reduction Co., Chicago, Ill.

Aluminum Bronze Ingots.
Electric Smelting & Alum'n Co., Lockport, N. Y.

Aluminum Castings.
Aluminum Company of America, Pittsburg, Pa.
Light Foundry & Mfg. Co., Pottstown, Pa.

Aluminum Electrical Conductors.
Aluminum Company of America, Pittsburg, Pa.
British Aluminum Co., Ltd., New York and Toronto.

Aluminum Granulated.
Standard Rolling Mills Inc., Brooklyn, N. Y.
United Smelt. & Aluminum Co., New Haven, Conn.
U. S. Reduction Co., Chicago, Ill.

Aluminum Ingots.
Aluminum Company of America, Pittsburgh, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
British Aluminum Co., Ltd., New York and Toronto.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Fuerst Bros. & Co., New York.
Kemp, W. H., Co., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Trotter, Nathan, & Co., Philadelphia, Pa.
United Smelt. & Aluminum Co., New Haven, Conn.
U. S. Reduction Co., Chicago, Ill.

Aluminum Match Plates.
British Aluminum Co., Ltd., New York and Toronto.
Churchill, W. L., New York.
Turner Machine Co., Philadelphia, Pa.

Aluminum Moldings and Extruded Shapes.
Aluminum Company of America, Pittsburgh, Pa.
British Aluminum Co., Ltd., New York and Toronto.

Aluminum Powder, Leaf and Foil.
British Aluminum Co., Ltd., New York and Toronto.
Kemp, W. H., Co., New York.

Aluminum Rivets.
British Aluminum Co., Ltd., New York and Toronto.
Hassall, John, Inc., Brooklyn, N. Y.
Kemp, W. H., Co., New York.

Aluminum Sheets, Rods and Wire.
Aluminum Company of America, Pittsburg, Pa.
British Aluminum Co., Ltd., New York and Toronto.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Fuerst Bros. & Co., New York.
Kemp, W. H., Co., New York.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
United Smelt. & Aluminum Co., New Haven, Conn.

Aluminum Solder (See Solder).

Aluminum Tubes.
Aluminum Company of America, Pittsburg, Pa.
British Aluminum Co., Ltd., New York and Toronto.
Kemp, W. H., Co., New York.

Ammeters and Voltmeters (See also Platers' Supplies).
Boissier Electric Co., New York.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.

Amyl Acetate (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Cooper, Charles, & Co., New York.
Dupont Chemical Works, New York.
Franco-American Chemical Co., Carlstadt, N. J.
Wiarda & Co., John C., Brooklyn, N. Y.

Annealing Muffles.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Quigley Furnace & Foundry Co., New York.
Rockwell, W. S., Co., New York.

Annealing Pans.
Sly, W. W., Mfg. Co., Cleveland, O.

Anodes, Brass, Copper or Nickel (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Fuerst Bros. & Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Hussey, C. G., & Co., Pittsburg, Pa.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.
Stamford Rolling Mills, Inc., New York.
Stevens, Frederic B., Detroit, Mich.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Anodes, Gold or Silver.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Jackson, John J., Newark, N. J.

Anodes, Platinum (See Platers' Supplies).

Anodes, Silver (See also Platers' Supplies).
Jackson, John J., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.

Anodes, Zinc (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Wiarda & Co., John C., Brooklyn, N. Y.

Antimonial Lead.
Leavitt, C. W., & Co., New York.
North American Smelting Co., Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Antimony Metal.
Birkenstein, S., & Sons, Chicago, Ill.
Cooper, Charles, & Co., New York.
Fuerst Bros. & Co., New York.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Trotter, Nathan, & Co., Philadelphia, Pa.
U. S. Reduction Co., Chicago, Ill.
Wiarda & Co., John C., Brooklyn, N. Y.

Assayers and Chemists.
Dover Laboratory, Dover, N. J.
Ledoux & Co., New York.

Automatic Buffing and Polishing Machines.
Automatic Buffing Machine Co., Buffalo, N. Y.

Automatic Wire and Metal Working Machinery.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Shuster, F. B., Co., New Haven, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Babbit Metals.
Ajax Metal Co., Philadelphia, Pa.
American Manganese Bronze Co., Philadelphia, Pa.
Benson, H. K., & F. S., Glen Ridge, N. J.
Birkenstein, S., & Sons, Chicago, Ill.
Columbia Smelting & Refining Works, New York.
Damascus Bronze Co., Pittsburg, Pa.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Fuerst Bros. Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Union Smelting & Refining Co., New York.

Babbitt Molds.
Schweizer, Chas. K., Co., St. Louis, Mo.

Bakelite.
General Bakelite Co., New York.

Baking Ovens.
Gehnrich, Herman, New York.
General Electric Co., Schenectady, N. Y.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Ball-Bearing Polishing Lathes.
Gardner Machine Co., Beloit, Wis.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.

Balls, Steel, for Burnishing.
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Smith, Richardson Co., Attleboro, Mass.

Belts Polishing.
Ames Sword Co., Chicopee, Mass.
Burns, E. R. Supply Co., Brooklyn, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.

Bismuth.
Cooper, Charles, & Co., New York.
Fuerst Bros. & Co., New York.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Trotter, Nathan, & Co., Philadelphia, Pa.

Block Tin (See Tin).

Block Tin Pipe.
North American Smelting Co., Philadelphia, Pa.
Standard Rilling Mills Inc., Brooklyn, N. Y.

Blowers and Blow Piping.
Astle, H. J., & Co., Providence, R. I.
Clarage Fan Co., Kalamazoo, Mich.
Drachsler, A. A., New York.
Knickerbocker Company, Jackson, Mich.
Leiman Bros., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Ohio Blower Co., Cleveland, O.

Boiler Graphite.
Dixon, Jos., Crucible Co., Jersey City, N. J.

Boron Copper Products.
American Boron Products Co., Reading, Pa.
General Electric Co., Schenectady, N. Y.

Boron Flux.
General Electric Co., Schenectady, N. Y.

Brass and Bronze Architectural Work.
Manhattan Brass Co., New York.

Brass Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
American Manganese Bronze Co., Philadelphia, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Damascus Bronze Co., Pittsburg, Pa.
Genesee Metal Co., Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'f'd Copper Co., New Bedford, Mass.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Brass, Bronze, Copper and Oreide Sheet Wire, Rod, Etc.
American Brass Co., The, Waterbury, Conn.
American Cupro-Nickel Co., New York.
American Manganese Bronze Co., Philadelphia, Pa.
Benson, H. K. & F. S., Glen Ridge, N. J.
Bridgeport Brass Co., Bridgeport, Conn.
Damascus Bronze Co., Pittsburg, Pa.
Hendricks Bros., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Lang, R. F., New York.
Leavitt, C. W., & Co., New York.
Manhattan Brass Co., New York.
National Brass & Copper Co., Lisbon, O.
National, The, Co., Waterbury, Conn.
Pilling Brass Co., Waterbury, Conn.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Stamford Rolling Mills, Inc., New York.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Brass, Bronze, Copper and Oreide Tubes.
American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Manhattan Brass Co., New York.
Riverside Metal Co., Riverside, N. J.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Wells, A. H., Co., Waterbury, Conn.

Brass and Bronze Founders.
Ajax Metal Co., Philadelphia, Pa.
American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Brass Foundry Equipment (See Foundry Supplies and Equipment).

Brass Goods, Plumbers'.
Bridgeport Brass Co., Bridgeport, Conn.
Manhattan Brass Co., New York.

Brass Mill Machinery.
Torrington Mfg. Co., Torrington, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburgh, Pa.
Waterbury (Conn.) Farrel Fdy. & Machine Co.

Brazing Solder (See Solder).

Britannia Metal.
Benson, H. K. & F. S., Glen Ridge, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Bronze and Composition Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
American Brass Co., The, Waterbury, Conn.
American Manganese Bronze Co., Philadelphia, Pa.
Damascus Bronze Co., Pittsburg, Pa.
Genesee Metal Co., Rochester, N. Y.
North American Smelting Co., Philadelphia, Pa.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'f'd Copper Co., New Bedford, Mass.
Titan Metal Co., Pellefonte, Pa.
Whipple & Choate, Bridgeport, Conn.

Bronze Sheets, Wire Rods, Etc. (See Brass, Bronze and Copper Sheets, Etc).

Bronze Tubes (See Brass, Bronze and Copper Tubes).

Brushes, Wire and Bristle (See also Foundry Supplies and Platers' Supplies).
Blumenthal, H., & Co., New York.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Buckle Machinery (See Automatic Wire and Metal Working Machinery).

Buffing Machinery (See Polishing, Buffing and Burnishing Machinery).

Buffing and Polishing Compositions (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Fuerst Bros. Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Stevens, Frederic B., Detroit, Mich.
Wiarda, John C., & Co., Brooklyn, N. Y.

Buffing and Polishing Supplies (See Polishing and Buffing Machinery and Equipment).

Buffing and Polishing Wheels (See also Platers' Supplies).
Burns, E. R., Supply Co., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Brothers Co., Utica, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Stevens, Frederic B., Detroit, Mich.

Bull-Dozers.
Wood, R. D., & Co., Philadelphia, Pa.

Burners, Enclosed Flame Gas.
Gehnrich, Hermann, New York.

Burners, Fuel Oil or Gas (See also Foundry Supplies).
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Quigley Furnace & Foundry Co., New York.
Rockwell, W. S., & Co., New York.

Burners, Powdered Coal.
Quigley Furnace & Foundry Co., New York.

Burnishing Barrels (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Parsons, W. R., Chicago, Ill.
Smith, Richardson Co., Attleboro, Mass.
Stevens, Frederic B., Detroit, Mich.
Tolhurst Machine Works, Troy, N. Y.

Burnishing Barrels, Leather Metal for.
Hanson & Van Winkle Co., Newark, N. J.

Burnishing Compounds and Chips (See also Platers' and Polishers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
International Chemical Co., Camden, N. J.
Stevens, Frederic B., Detroit, Mich.

Button Machinery (See Automatic Wire and Metal Working Machinery).

Cabbaging Presses.
Wood, R. D., & Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

Cadmium Metallic.
Cooper, Charles, & Co., New York
Leavitt, C. W., & Co., New York.
Richards & Co., Boston, Mass.

Carbonate of Potash.
Apothecaries Hall Co., Waterbury, Conn.
Fuerst Bros. & Co., New York.
Roessler & Hasslacher Chemical Co., New York.
Wiarda, John C., & Co., Brooklyn, N. Y.

Carboy Rockers.
Munning-Loeb Co., Matawan, N. J.

Case Hardening Materials.
Buchanan, C. G., Chemical Co., Cincinnati, O.

Castings (See name of metal wanted).

Castings, Iron Machinery.
Bliss Co., E. W., Brooklyn, N. Y.
Quigley Furnace & Foundry Co., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Caustic Potash (See Platers', Polishers' and Galvanizers' Supplies).

Centrifugal Dryers and Extractors.
Hanson & Van Winkle Co., Newark, N. J.
No-Dust Drying Machine Co., Providence, R. I.
Tolhurst Machine Works, Troy, N. Y.

Chain Machinery (See Automatic Wire and Metal Working Machinery).

Chaplets Perforated (See Foundry Supplies).

Charcoal, Powdered and Granulated.
Paxson, J. W., Co., Philadelphia, Pa.
Phipps Charcoal Co., Ironton, O.
Stevens, Frederic B., Detroit, Mich.

Chasing and Modeling.
G. Kelch, New York.

Chemicals (See Platers' Supplies).

Chemists.
Dover Laboratory, Dover, N. J.
Ledoux & Co., New York.

Chloride of Iron.
Roessler & Hasslacher Chemical Co., New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Chromium (Pure) and Chromium Cupro.
Goldschmidt Thermit Co., New York.

Chucks, Spinning.
Bliss, E. W., Co., Brooklyn, N. Y.
Pryibil, P., Inc., New York.
Wilcor Manufacturing Co., Chicago, Ill.

Cinder Mills, Water (See also Foundry Supplies).
Standard Equipment Co., New Haven, Conn.
Whiting Foundry & Equipment Co., Harvey, Ill.

Cleaning Compounds for Metals (See also Platers' Supplies).
Anthony, H. M., & Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Buchanan, C. G., Chemical Co., Cincinnati, O.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Rhodes, James H., & Co., New York.
Stevens, Frederic B., Detroit, Mich.
Stitt, Jas. H., Co., New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Cock Grinders Automatic.
Turner Machine Co., Philadelphia, Pa.

Coiling Machines (See also Rolling Mill Machinery).
Baird Machine Co., Bridgeport, Conn.
Torrington Manufacturing Co., Torrington, Conn.

Cold Rolling Mills (See Rolling Mill Machinery).

Composition Metal Tacks, Nails, Etc.
Hussey, C. G., & Co., Pittsburg, Pa.

Compositions, Buffing (See Buffing and Polishing Compositions).

Compressors, Centrifugal, Air and Gas.
General Electric Co., Schenectady, N. Y.

Consulting Engineers, Mechanical.
Wood, W. A., New York.

Consulting Expert, Mill Operation.
Wood, R. A., Cheshire, Conn.

Consulting Platers (See also Expert Instruction).

Copper Bearing Material, Buyers of (See Metal Turnings, Drosses, Residues, Etc.).

Copper, Carbonate of.
Apothecaries Hall Co., Waterbury, Conn.
Buchanan, C. G., Chemical Co., Cincinnati, O.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Cooper, Charles, & Co., New York.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Hanson & Van Winkle Co., Newark, N. J.
Roessler & Hasslacher Chemical Co., New York.
Stevens, Frederic B., Detroit, Mich.
Wiarda & Co., John C., Brooklyn, N. Y.

Copper Castings.
Ajax Metal Co., Philadelphia, Pa.
American Manganese Bronze Co., Philadelphia, Pa.

Copper Cyanide.
Apothecaries Hall Co., Waterbury, Conn.
Roessler & Hasslacher Chemical Co., New York.
Wiarda, John C., & Co., Brooklyn, N. Y.

Copper Ingots.
Balbach Smelting & Refining Co., Newark, N. J.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Brothers, New York.
Lang, R. F., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Taunton-New B'f'd Copper Co., New Bedford, Mass.
Trotter, Nathan, & Co., Philadelphia, Pa.
United Metals Selling Co., New York.
White & Bro., Inc., Philadelphia, Pa.

Copper Nails and Tacks.
Hassall, John, Inc., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Scovill Manufacturing Co., Waterbury, Conn.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Copper Rivets.
Hassall, John, Inc., New York.
Hendricks Bros., New York.

Copper Sheets, Wire, Rods, Bolts, Etc. (See Brass, Bronze and Copper Sheets, Etc).

Copper Shot.
Riverside Metal Co., Riverside, N. J.
Seymour Manufacturing Co., Seymour, Conn.

Copper, Sulphate of.
Apothecaries Hall Co., Waterbury, Conn.
Munning-Loeb Co., Matawan, N. J.
Roessler & Hasslacher Chemical C., New York.
Stevens, Frederic B., Detroit, Mich.
Wiarda, John C., & Co., Brooklyn, N. Y.

Copper Trysalyt.
Apothecaries Hall Co., Waterbury, Conn.
Roessler & Hasslacher Chemical Co., New York.

Copper Tubes (See Brass and Copper Tubes).

Core Compound (See also Foundry Supplies).
Dixon, Jos., Crucible Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Core Machines (See Foundry Supplies).
Wadsworth Core Machine & Equip. Co., Akron, O.

Core Oil (See Core Compound).

Core Ovens (See also Foundry Supplies).
Coleman Foundry Equipment Co., Cleveland, O.
Gehnrich, Hermann, New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Quigley Furnace & Foundry Co., New York.
Stevens, Frederic B., Detroit, Mich.
Steiner, E. E., Newark, N. J.
Wadsworth Core Machine and Equip Co., Akron, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Trays, Steel.
Wadsworth Core Machine & Equip. Co., Akron, O.

Countershafts, Ball Bearing.
Gardner Machine Co., Beloit, Wis.

Cranes.
Whiting Foundry Equipment Co., Harvey, Ill.

Crocus and Buffing Compositions (See Buffing and Polishing Compositions).

Crucibles, Stirrers, Stopers, Nozzles, Etc. (See also Foundry Supplies).
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Ross-Tacony Crucible Co., Philadelphia, Pa.
Seidel, R. B., Inc., Philadelphia, Pa.
Taylor, R. J., Inc., Philadelphia, Pa.

Crushed Steel Abrasives.
Pittsburg Crushed Steel Co., Pittsburg, Pa

Crushers, Cinder (See also Foundry Supplies).
Coleman Foundry Equipment Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.
Standard Equipment Co., New Haven, Conn.
Stevens, Frederic B., Detroit, Mich.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Whiting Foundry Equipment Co., Harvey, Ill.

Cube Nickel.
Fuerst Bros. & Co., New York.
Wiarda, John C., & Co., Brooklyn, N. Y.

Cupolas.
Paxson, J. W., Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Cyanide of Potassium (See Platers' Supplies).

Cyanide of Sodium (See Platers' Supplies).

Deoxidizers for Copper.
General Electric Co., Schenectady, N. Y.

Die-Casting Machinery.
Doehler Die Casting Co., Brooklyn, N. Y.

Die Casting, Brass and Bronze.
Doehler Die Casting Co., Brooklyn, N. Y.

Die Castings, White Metal.
Acme Die Casting Corp., Brooklyn, N. Y.
Doehler Die Casting Co., Brooklyn, N. Y.
Light Foundry & Mfg. Co., Pottstown, Pa.

Dies, Sheet Metal Working.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Globe Machine & Stamping Co., Cleveland, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Dipping Baskets, Wire.
Driver-Harris Wire Co., Newark, N. J.
Smith, John P., & Co., New Haven, Conn.

Dipping Baskets, Stoneware.
German-American Stoneware Works, New York.

Disc Polishing and Grinding Machines.
Gardner Machine Co., Beloit, Wis.

Draw Benches—Wire, Rod and Tube.
Leiman Bros., New York.
Torrington Mfg. Co., Torrington, Conn.
Waterbury (Conn.), Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Drill Presses.
Clark, Jr., Electric Co., Jas., Louisville, Ky.

Drosses (See Metal Turnings, Drosses, Etc.).

Drop Hammers.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Drying-Out Machines.
Astle, H. J., & Co., Providence, R. I.
Baird Machine Co., Bridgeport, Conn.
No-Dust Drying Machine Co., Providence, R. I.
Smith, Richardson Co., Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.
Torrington Mfg. Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Drying Ovens.
Gehnrich, Herman, Brooklyn, N. Y.
General Electric Co., Schenectady, N. Y.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Dust Arresters.
Whiting Foundry & Equipment Co., Harvey, Ill.

Dust Collectors and Ventilating Systems.
Astle, H. J., & Co., Providence, R. I.
Clarage Fan Co., Kalamazoo, Mich.
Drachsler, A. A., New York.
Knickerbocker Co., The, Jackson, Mich.
Leiman Bros., New York.
Ohio Blower Co., Cleveland, O.
Sly, W. W., Mfg. Co., Cleveland, O.

Dynamos, Platers' and Galvanizers' (See also Platers' Supplies).
Astle, H. J., & Co., Providence, R. I.
Bogue, Chas. J. Electric Co., New York.
Boissier Electric Co., New York.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Clark, Jr., Electric Co., Jas., Louisville, Ky.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
General Electric Co., Schenectady, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F. & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Stevens, Frederic B., Detroit, Mich.

Electric Cleaning Compounds (See Cleaning Compounds, Metal).

Electric Drills, Grinders, Etc.
Clark, Jr., Electric Co., Jas., Louisville, Ky.

Electrogalvanizing Equipment (See Galvanizing Equipment).

Electroplaters' Centrifugal Dryers.
No-Dust Drying Machine Co., Providence, R. I.
Tolhurst Machine Works, Troy, N. Y.

Electroplating Equipment (See Platers', Polishers' and Galvanizing Equipment and Supplies).

Electroplating, Polishing, Coloring, Etc.
Bay State Wheel Co., East Templeton, Mass.
Enterprise Mfg. Co., Akron, O.
Hassell, John, Inc., Brooklyn, N. Y.
Root, C. J., & Co., Bristol, Conn.
Sievering, Philip, New York.

Elevators.
Whiting Foundry Equipment Co., Harvey, Ill.

Emery (See Platers', Polishers' and Galvanizers' Supplies).

Emery Wheel Dressing Machine.
Divine Brothers Co., Utica, N. Y.

Emery Wheels (See Grinding Machinery).

Enameling and Japanning Ovens.
Gehnrich, Herman, Brooklyn, N. Y.
General Electric Co., Schenectady, N. Y.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Steiner, E. E., Newark, N. J.

Enamels, Lacquer (See Lacquer Enamels).

Engineers, Foundry.
Whiting Foundry Equipment, Harvey, Ill.

Engineers, Furnace.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Escutcheon Pins, All Metals.
Hassell, John, Brooklyn, N. Y.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Ethyl Acetate.
Franco American Chemical Co., Carlstadt, N. J.

Exhaust Fans and Heads.
Clarage Fan Co., Kalamazoo, Mich.
Drachsler, A. A., New York.
General Electric Co., Schenctady, N. Y.
Knickerbocker Co., Jackson, Mich.
Leiman Bros., New York.
Ohio Blower Co., Cleveland, O.

Exhaust Fans, Stoneware.
German-American Stoneware Works, New York.

Expert Instruction—Plating, Coloring, Dipping, Etching, Etc.
Blasset, E., Jr., New York.

Extractors, Centrifugal, Drying.
Tolhurst Machine Works, Troy, N. Y.

Facings (See Foundry Facings).

Felt Polising Wheels.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Hansome & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Munning-Loeb Co., Matawan, N. J.

Ferro Case.
Buchanan, C. G., Chemical Co., Cincinnati, O.

Fig Cleanser.
Burns, E. R., Supply Co., Brooklyn, N. Y.
International Chemical Co., Camden, N. J.

Fillets, Leather (See Foundry Supplies and Equipment).

Fire Brick (See also Foundry Supplies).
Stevens, Frederick B., Detroit, Mich.

Flasks, Aluminum Snap.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Flasks, Brass Molders' (See also Foundry Supplies).
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.

Fluxes for Metals.
American Boron Products Co., Reading, Pa.
Basic Mineral Co., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.

Fluxes, Soldering and Tinning.
Buchanan, C. G., Chemical Co., Cincinnati, O.
Richards & Co., Boston, Mass.

Forming Machines (See Automatic Wire and Metal Working Machinery).

Forgings, Automobile
American Manganese Bronze Co., Philadelphia, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Phosphor Bronze Smelting Co., Philadelphia, Pa.

Foundry Facings (See Foundry Supplies).

Foundry Pails.
Sly, W. W., Mfg. Co., Cleveland, O.

Foundry Supplies and Equipment (See also Foundry Facings, Furnaces, Etc.).
Basic Mineral Co., Pittsburgh, Pa.
Battle Creek Sand Sifter Co., Battle Creek, Mich.
Birkenstein, S., & Sons, Chicago, Ill.
Blumenthal, H., & Co., New York.
Clarage Fan Co., Kalamazoo, Mich.
Coleman Foundry Equipment Co., Cleveland, O.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
Gehnrich, Hermann, Brooklyn, N. Y.
Hawley Down Draft Furnace Co., Easton, Pa.
Ideal Furnace Co., Chester, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Quigley Furnace & Foundry Co., New York.
Rockwell, W. S., Co., New York.
Standard Equipment Co., New Haven, Conn.
Steiner, E. E., Newark, N. J.
Stevens, Frederic B., Detroit, Mich.
Turner Machine Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip. Co., Akron, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnace Insulation.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Furnace Linings (See also Foundry Supplies).
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Annealing, Brazing, Etc.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Quigley Furnace & Foundry Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Crucible (See Furnaces, Melting).

Furnaces, Electric.
General Electric Co., Schenectady, N. Y.

Furnaces, Galvanizing and Tinning.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Quigley Furnace & Foundry Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Melting, for Oil, Coal, Coke or Gas (See also Foundry Supplies).
Coleman Foundry Equipment Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Hawley Down Draft Furnace Co., Easton, Pa.
Ideal Furnace Co., Chester, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Quigley Furnace & Foundry Co., New York.
Rockwell, W. S., Co., New York.
Stevens, Frederic B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Powdered Coal Burning.
Quigley Furnace & Foundry Co., New York.

Furnaces, Reverberatory.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md
Rockwell, W. S., Co., New York.

Fusel Oil, Refined (See Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Cooper, Charles, & Co., New York.
Dupont Chemical Works, New York.
Fuerst Bros. & Co., New York.
Franco-American Chemical Co., Carlstadt, N. J.
Wiarda & Co., John C., Brooklyn, N. Y.

Galvanized Specialties, Nails, Screws, Etc.
Hassall, John, Inc., Brooklyn, N. Y.
Meaker, The, Company, Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Equipment.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Meaker, The Company, Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing for the Trade.
Hassall, John, Inc., Brooklyn, N. Y.
Meaker, The, Company, Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Gas Producers and Power Plants.
Wood, R. D., & Co., Philadelphia, Pa.

Generators and Motors (See also Dynamos, etc.).
Clark, Jr., Electric Co., Jas., Louisville, Ky.
General Electric Co., Schenectady, N. Y.

German Silver Ingots, Castings, Sheets, Wire Rods, Tubes.
American Brass Co., Waterbury, Conn.
American Cupro-Nickel Co., New York.
Bridgeport Brass Co., Bridgeport, Conn.
Pilling Brass Co., Waterbury, Conn.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Stamford Rolling Mills, Inc., New York.

Gold Alloys.
Riverside Metal Co., Riverside, N. J.

Gold Anodes (See Anodes).

Gold, Chloride of.
Cooper, Charles, & Co., New York.

Gold, Ingots, Bars, Plates, Etc.
Riverside Metal Co., Riverside, N. J.

Gold and Silver Refiners.
Jackson, John J., Co., Newark, N. J.
Roessler & Hasslacher Chemical Co., New York.
Riverside Metal Co., Riverside, N. J.

Gold Trysalyt.
Roessler & Hasslacher Chemical Co., New York.

Graphite (See Foundry Supplies.).

Grinding Machinery.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Clark, Jr., Electric Co., Jas., Louisville, Ky.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Divine Brothers Co., Utica, N. Y.
Gardner Machine Co., Beloit, Wis.
L'Hommedieu, Chas. F. & Sons Co., Chicago, Ill.
Stevens, Frederick B., Detroit, Mich.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Grinding Wheels (See Foundry Supplies).

Hack Saws.
Clark, Jr., Electric Co., Jas., Louisville, Ky.

Hoists, Electric, Pneumatic, Head.
Clark, Jr., Electric Co., Jas., Louisville, Ky.
Whiting Foundry Equipment Co., Harvey, Ill.

Hydraulic Accumulators.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Hydraulic Machinery, Presses, Jacks, Etc.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Ingot Metals (See Name of Metal Wanted).

Ingot Molds (See Molds, Ingot).

Insulating Brick.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Japanning Ovens (See Enameling and Japanning Ovens).

Japans.
Apothecaries Hall Co., Waterbury, Conn.

Jewelers' Equipment and Supplies (See also Platers' Supplies).
Leiman Bros., New York.
No-Dust Drying Machine Co., Providence, R. I.
Smith, Richardson Co., Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.

Jewelers' Findings.
Smith, Richardson Co., Attleboro, Mass.

Kalye.
Anthony Co., H. M., New York.

Lacquering Ovens.
Astle, H. J., & Co., Providence, R. I.
Gehnrich, Herman, Brooklyn, N. Y.
General Electric Co., Schenectady, N. Y.
Steiner, E. E., Newark, N. J.

Lacquer Sprayers.
De Vilbiss Mfg. Co., Toledo, O.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Eureka Pneumatic Spray Co., New York.
Paasche Air Brush Co., Chicago, Ill.

Lacquers and Enamels (See also Platers' Supplies).
Celluloid Zapon Co., New York.
Cooper, Charles, & Co., New York.
Damard Lacquer Co., New York.
Dupont Chemical Works, New York.
Egyptian Lacquer Manufacturing Co., New York.
Eureka Pneumatic Spray Co., New York.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

General Bakelite Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch, Franklin H., Co., New York.

Ladle Heaters and Dryers (See also Foundry Supplies).
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Ladles (See also Foundry Supplies).
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Lathers, Polishing (See Platers' and Polishers' Supplies).

Lathes, Brass Finishers'.
Bliss, E. W., Co., Brooklyn, N. Y.
Stevens, Frederic B., Detroit, Mich.
Waterbury (Conn) Farrel Foundry & Machine Co.

Lathes, Spinning.
Pryibil, P., Inc., New York.
Wilcor Manufacturing Co., Chicago, Ill.

Lead, Antimonial.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead Castings, Antimonial.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead-Coated Sheet Iron and Steel.
Ajax Metal Co., Philadelphia, Pa.

Leaden Ware and Lead Burning.
Chadwick-Boston Lead Co., Boston, Mass.
Wiarda & Co., John C., Brooklyn, N. Y.

Lead, Pig and Bar.
Birkenstein, S., & Sons, Chicago, Ill.
Chadwick-Boston Lead Co., Boston, Mass.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Trotter, Nathan, & Co., Philadelphia, Pa.
United Metals Selling Co., New York.
U. S. Reduction Co., Chicago, Ill.

Lead Pipe.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Union Smelting & Refining Co., New York.

Lead Strips and Moldings.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

Leather Meal for Dry Tumbling (See also Platers' Supplies).
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F. & Sons Co., Chicago, Ill.

Lubricants.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

Lycopodium (See also Foundry Supplies)
Apothecaries Hall Co., Waterbury, Conn.
Cooper, Charles, & Co., New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Magnesium Metal.
Cooper, Charles, & Co., New York.
Fuerst Bros. & Co., New York.
Goldschmidt Thermit Co., New York.
Leavitt, C. W., & Co., New York.
Roessler & Hasslacher Chemical Co., New York.

Magnetic Metal Separators (See also Foundry Supplies).
Dings Electro-Mag. Separator Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Paxson, J. W., Co., Philadelphia, Pa.

Manganese Bronze (See Bronze and Composition Ingots and Castings).

Manganese, 98-99%.
Goldschmidt Thermit Co., New York.

Manganese Aluminum (10-90%).
Goldschmidt Thermit Co., New York.

Manganese Bronze Sheets, Rods, Etc.
American Manganese Bronze Co., Philadelphia, Pa.
Bridgeport Brass Co., Bridgeport, Conn.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Manganese Copper.
Ajax Metal Co., Philadelphia, Pa.
Electric Smelting & Alum Co., Lockport, N. Y.
Goldschmidt Thermit Co., New York.
Lang, R. F., New York.
Leavitt, C. W., & Co., New York.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

Manganese Metal.
Cooper, Charles, & Co., New York.
Goldschmidt Thermit Co., New York.
Leavitt, C. W., & Co., New York.
Roessler & Hasslacher Chemical Co., New York.

Match Plates.
Turner Machine Co., Philadelphia, Pa.

McLain's System of Mixing Semi-Steel, Iron, Etc.
McLain, David, Milwaukee, Wis.

Mechanical Engineers.
Wood, W. A., New York.

Metallurgists, Consulting.
Dover Laboratory, Dover, N. J.
Ledoux & Co., New York.

Metals (See name of metal wanted).

Metals, Dealers in All Kinds of New (See also name of metal wanted).
Birkenstein, S., & Sons, Chicago, Ill.
Richards & Co., Boston, Mass.
Trotter, Nathan, & Co., Philadelphia, Pa.

Metals, Dealers in Old.
Birkenstein, S., & Sons, Chicago, Ill.
Capper Pass & Son, Ltd., Bristol, England.
Genesee Metal Co., Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Moers, E. M., Sons, New York.
Radnai, Josef, New York.
Riverside Metal Co., Riverside, N. J.
United Smelt. & Aluminum Co., New Haven, Conn.

Metals, Dealers in Old—Gold, Silver, Platinum.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Fluxes (See Fluxes for Metals).

Metal Goods Made to Order.
American Brass Co., Waterbury, Conn.
Baird Machine Co., Bridgeport, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Enterprise Mfg. Co., Akron, O.
Fuerst Bros. & Co., New York.
Manhattan Brass Co., New York.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Vaughn, L. H., Mfg. Co., Taunton, Mass.

Metals, Plated Sheet.
American Nickeloid Co., Peru, Ill.
Apollo Metal Works, La Salle, Ill.
Benson, H. K. & F. S., Glen Ridge, N. J.
National Sheet Metal Co., Peru, Ill.

Metal, Silver Plated Sheet.
Benson, H. K. & F. S., Glen Ridge, N. J.

Metal Spraying Machines.
Metals Coating Co. of America, Chicago, Ill.

Metals (Carbon Free).
Goldschmidt Termit Co., New York.

Metal Turnings, Drosses, Residues, Etc., Buyers of.
Ajax Metal Co., Philadelphia, Pa.
Balbach Smelting & Refining Co., Newark, N. J
Birkenstein, S., & Sons, Chicago, Ill.
Capper Pass & Son, Ltd., Bristol, England.
Illinois Smelting & Refining Co., Chicago, Ill.
Moers, E. M., Sons, New York.
Radnai, Josef, New York.
Union Smelting & Refining Co., New York.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Meters, Flow, Air, Gas, and Water.
General Electric Co., Schenectady, N. Y.

Mineral Cleaner.
Apothecaries Hall Co., Waterbury, Conn.
Electric Smelting & Alum'n Co., Lockport, N. J.

Modeling and Chasing.
G. Kelch, New York.

Mold Dryers, Portable (See also Foundry Supplies).
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., & Co., Philadelphia, Pa.

Molds, Ingot (See also Foundry Supplies).

Mold Sprayers.
Paxson, J. W., Co., Philadelphia, Pa.
Schweizer, Chas. K., Co., St. Louis, Mo.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Molds, Water-Cooled, for Babbit, Etc.
Schweizer, Chas. K., Co., St. Louis, Mo.

Molding Machines (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Turner Machine Co., Philadelphia, Pa.

Molding Sand (See Sand).

Monel Metal.
International Nickel Co., New York.

Motors (See Dynamos, Etc.).

Mouldmakers.
G. Kelch, New York.

Muntz's Metal—Sheets, Rods, Bolts, Nails, Etc.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Nails, All Metals.
Hassall, John, Brooklyn, N. Y.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Nichrome Dipping Baskets.
Driver-Harris Wire Co., Harrison, N. J.

Nickel.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Fuerst Bros. & Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Hendricks Bros., New York.
International Nickel Co., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Munning-Loeb Co., Matawan, N. J.
Richards & Co., Boston, Mass.
Trotter, Nathan, & Co., Philadelphia, Pa.
Wiarda & Co., John C., Brooklyn, N. Y.

Nickel-Bronze Castings and Ingots.
Damascus Bronze Co., Pittsburg, Pa.

Nickel Castings.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., Sons & Co., Chicago, Ill.
International Nickel Co., New York.
Munning-Loeb Co., Matawan, N. J.
Wiarda & Co., John C., Brooklyn, N. Y.

Nickel Plating (See Electroplating).

Nickel Salts (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Cooper, Charles, & Co., New York.
Crown Rheostat & Supply Co., Chicago, Ill.
Fuerst Bros. & Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Lang, R. F., New York.
L'Hommedieu, Chas. F., Sons & Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Roessler & Hasslacher Chemical Co., New York.
Stevens, Frederick B., Detroit, Mich.
Wiarda & Co., John C., Brooklyn, N. Y.

Nickel Sheets.
Seymour Mfg. Co., Seymour, Conn.

Nickel, Shot.
Fuerst Bros. & Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
International Nickel Co., New York.
Munning-Loeb Co., Matawan, N. J.
Seymour Manufacturing Co., The, Seymour, Conn
Wiarda & Co., John C., Brooklyn, N. Y.

Nickel Silver Tubes.
Wells, A. H., & Co., Waterbury, Conn.

Oil Pumps and Storage Tanks.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Quigley Furnace & Foundry Co., New York.
Rockwell Co., W. S., New York.

Oils, Temperings and Lubricating.
Apothecaries Hall Co., Waterbury, Conn.

Oven Insulation.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Ovens (See Baking, Drying, Lacquering, Japanning, Enameling and Sheradizing Ovens. Also Foundry Supplies).

Overhead Trolleys and Tracks.

Parting Compounds (See also Foundry Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Stevens, Frederic B., Detroit, Mich.

Pattern Shop Supplies (See Foundry Supplies).

Patterns, Mounted.
Turner Machine Co., Philadelphia, Pa.

Perforated Metals.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Pewter.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Phosphor Bronze Ingots, Castings, Etc.
Ajax Metal Co., Philadelphia, Pa.
Damascus Bronze Co., Pittsburgh, Pa.
Illinois Smelting & Refining Co., Chicago, Ill.
Lang, R. F., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Bronze Sheets, Wire Rods, Etc.
Bridgeport Brass Co., Bridgeport, Conn.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Pilling Brass Co., Waterbury, Conn.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Copper and Phosphor Tin.
Ajax Metal Co., Philadelphia, Pa.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Goldschmidt Thermit Co., New York.
Lang, R. F., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

Phosphorizers (See Crucibles, Etc.).

Phosphorus (See also Foundry Supplies).
General Chemical Co., Philadelphia, Pa.

Pickling Compounds.
Hanson & Van Winkle Co., Newark, N. J.

Pickling Machines, Automatic.
Torrington Manufacturing Co., Torrington, Conn.

Pin Machines (See Automatic Wire and Metal Working Machines).

Pipe Covering.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Plastic Bronze.
Ajax Metal Co., Philadelphia, Pa.

Plated Sheet Metal (See Metals, Plated Sheet).

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Platers' Compound (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
International Chemical Co., Camden, N. J.
Wiarda & Co., John C., Brooklyn, N. Y.

Platers' Metal (See also Platers' Supplies).
Kemp, W. H., Co., New York.
Pilling Brass Co., Waterbury, Conn.

Platers', Polishers' and Galvanizers' Equipment and Supplies.
Abbott Ball Co., Hartford, Conn.
Ames Sword Co., Chicopee, Mass.
Anthony, H. M., Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Astle, H. J., & Co., Providence, R. I.
Automatic Buffing Machine Co., Buffalo, N. Y.
Baird Machine Co., Bridgeport, Conn.
Blumenthal, H., & Co., New York.
Bogue, Chas. J., Electric Co., New York.
Boissier Electric Co., New York.
Buchanan, C. G., Chemical Co., Cincinnati, O.
Burns, E. Reed, Supply Co., Brooklyn, N. Y.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Cooper, Charles, & Co., New York.
Corcoran, A. J., Inc., New York.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Brothers Co., Utica, N. Y.
Driver-Harris Wire Co., Harrison, N. J.
Eager Electric Co., Watertown, N. Y.
Fuerst Bros. & Co., New York.
Gardner Machine Co., Beloit, Wis.
General Electric Co., Schenectady, N. Y.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Camden, N. J.
Lang, R. F., New York.
Leiman Bros., New York.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Meaker, The, Company, Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
No-Dust Drying Machine Co., Providence, R. I.
Parsons, W. R., Chicago, Ill.
Rhodes, James H., & Co., New York.
Roessler & Hasslacher Chemical Co., New York.
Smith, John P., & Co., New Haven, Conn.
Smith, Richardson Co., Attleboro, Mass.
Stevens, Frederic B., Detroit, Mich.
Stitt, Jas. H., Co., New York.
Tolhurst Machine Works, Troy, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Wiarda Co., John C., Brooklyn, N. Y.

Plating, Job.
Bay State Wheel Co., East Templeton, Mass.
Enterprise Mfg. Co., Akron, O.
Hassall, John, Inc., Brooklyn, N. Y.
Root, C. J., & Co., Bristol, Conn.
Sievering, Philip, New York.

Platinum, Sheet and Wire.
Roessler & Hasslacher Chemical Co., New York.

Platinum Scrap, Buyers of.
Radnai, Josef, New York.
Roessler & Hasslacher Chemical Co., New York.

Plumbago (See Graphite).

Pointing Machines (See Automatic Wire and Metal Working Machinery).

Polishing and Buffing Compositions (See Buffing and Polishing Compositions).

Polishing and Grinding Engineers.
Divine Brothers Co., Utica, N. Y.

Polishing, Buffing and Burnishing Machinery and Appliances (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
American Tool & Machine Co., Boston, Mass.
Ames Sword Co., Chicopee, Mass.
Astle, H. J., & Co., Providence, R. I.
Apothecaries Hall Co., Waterbury, Conn.
Automatic Buffing Machine Co., Buffalo, N. Y.
Baird Machine Co., Bridgeport, Conn.
Blumenthal, H., & Co., New York.
Clarage Fan Co., Kalamazoo, Mich.
Clark, Jr., Electric Co., Jas., Louisville, Ky.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Divine Brothers Co., Utica, N. Y.
Drachsler, A. A., New York.
Eager Electric Co., Watertown, N. Y.
Gardner Machine Co., Beloit, Wis.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Knickerbocker Co., Jackson, Mich.
Leiman Bros., New York.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
No-Dust Drying Machine Co., Providence, R. I.
Ohio Blower Co., Cleveland, O.
Osborn Mfg. Co., Cleveland, O.
Parsons, W. R., Chicago, Ill.
Pfleghar Hardware Sp'lty Co., New Haven, Conn.
Smith, Richardson Co., Attleboro, Mass.
Stevens, Frederic B., Detroit, Mich.
Tolhurst Machine Works, Troy, N. Y.

Polishing (See Polishing, Electroplating, Etc.).

Polishing, Belts, Endless (See also Platers' Supplies).
Ames Sword Co., Chicopee, Mass.
Divine Brothers Co., Utica, N. Y.
Munning-Loeb Co., Matawan, N. J.

Potash (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Cooper, Charles, & Co., New York.
Fuerst Bros. & Co., New York.
International Chemical Co., Camden, N. J.
Munning-Loeb Co., Matawan, N. J.
Niagara Falls Alkali Co., Niagara Falls, N. Y.
Roessler & Hasslacher Chemical Co., New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Presses, Bench and Foot.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Leiman Bros., New York.
Shuster, The F. B., Co., New Haven, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Cabbaging.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.
Watson-Stillman Co., New York.

Presses, Coining.
Bliss, E. W., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Drop.
Bliss, E. W., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Power.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Foundry Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Pressure Blowers (See also Foundry Supplies).
Astle, H. J., & Co., Providence, R. I.
Clarage Fan Co., Kalamazoo, Mich.
Drachsler, A. A., New York.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Eureka Pneumatic Spray Co., New York.
General Electric Co., Schenectady, N. Y.
Leiman Bros., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Whiting Foundry Equipment Co., Harvey, Ill.

Pumice.
Rhodes, James H., & Co., New York.

Refiners, Metal (See Smelters and Refiners).

Rheostats.
Crown Rheostat & Supply Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
L'Hommedieu, Chas. F., Sons & Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Stitt, Jas. H., Co., New York.

Riddles (See also Foundry Supplies).
Stevens, Frederic B., Detroit, Mich.

Riveting Machines.
Shuster, The F. B., Co., New Haven, Conn.
Wood, R. D., & Co., Philadelphia, Pa.

Rivets—Brass, Aluminum, Etc.
Hassell, John, Inc., New York.
Hendricks Bros., New York.
Kemp, W. H., Co., New York.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Roll-Grinding Machines.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Chilled and Sand.
Garrison, A., Fdy. & Machine Co., Pittsburgh, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Jewelers'.
Leiman Bros., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolling Mill Engineers.
Wood, W. A., New York.
Wood, R. A., Cheshire, Conn.

Rolling Mill Machinery.
Garrison, A., Fdy. & Machine Co., Pittsburgh, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rouge (See also Buffing and Polishing Compositions).
Rhodes, James H., & Co., New York.

Sand, Fire (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Sand for Blasting.
Paxson, J. W., Co., Philadelphia, Pa.

Sand, Crushed Steel, For Blasting.
Pittsburgh Crushed Steel, Co., Pittsburgh, Pa.

Sand Blast Machinery and Equipment.
Astle, H. J., & Co., Providence, R. I.
Leiman Bros., New York.
Mott Sand Blast Mfg. Co., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.
Standard Equipment Co., New Haven, Conn.
Stevens, Frederic B., Detroit, Mich.
Whiting Foundry & Equipment Co., Harvey, Ill.

Sand Blast Systems.
Mott Sand Blast Mfg. Co., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.
Standard Equipment Co., New Haven, Conn.
Whiting Foundry & Equipment Co., Harvey, Ill.

Sand Blast Tumbling Barrels.
Mott Sand Blast Mfg. Co., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.
Standard Equipment Co., New Haven, Conn.

Sand Dryers (See Foundry Supplies).

Sand Sifters and Mixers.
Battle Creek Sand Sifter Co., Battle Creek, Mich.
Turner Machine Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip. Co., Akron, O.

Sand Molding (See also Foundry Supplies).
Newport Sand Bank Co., Newport, Ky.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Sawdust, Boxwood, for Drying Purposes (See also Platers' Supplies).
Burns, E. R., Supply Co., Brooklyn, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Sommers, John, Faucet Co., Newark, N. J.
Wiarda, John C., & Co., Brooklyn, N. Y.

Sawdust Drying-Out Boxes (See also Platers' Supplies).
Astle, H. J., & Co., Providence, R. I.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
No-Dust Drying Machine Co., Providence, R. I.
Smith, Richardson Co., Attleboro, Mass.
Steiner, E. E., Newark, N. J.

Schoop Metal Spraying Process.
Metals Coating Co. of America, Chicago, Ill.

Scrap Metals (See Metal Turnings, Drosses, Residues, Etc.).

Separators, Oil and Steam.
Ohio Blower Co., Cleveland, O.

Shanks, Ladles and Crucible.
Whiting Foundry Equipment Co., Harvey, Ill.

Shears, Power.
Bliss, E. W., Co., Brooklyn, N. Y.
Garrison, A., Fdy. & Machine Co., Pittsburgh, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Sheet Metal Straightening, Cutting and Forming Machinery.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Shuster, The F. B., Co., New Haven, Conn.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Sheets, White Metal.
Union Smelting & Refining Co., New York.

Sheradizing (See also Galvanizing).
Globe Machine & Stamping Co., Cleveland, O.

Sheradizing Ovens.
Gehnrich, Herman, New York.
General Electric Co., Schenectady, N. Y.
Globe Machine & Stamping Co., Cleveland, O.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Shop Furniture, Etc.
Sly, W. W., Mfg. Co., Cleveland, O.

Silicon.
Leavitt, C. W., & Co., New York.

Silicon Copper.
Ajax Metal Co., Philadelphia, Pa.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelting & Alum'm Co., Lockport, N. Y.
Goldschmidt Thermit Co., New York.
Lang, R. F., New York.
Roessler & Hasslacher Chemical Co., New York.

Silver and Gold Granulated.
Jackson, John J., & Co., Newark, N. J.

Silver Cyanide.
Apothecaries Hall Co., Waterbury, Conn.
Roessler & Hasslacher Chemical Co., New York.

Silver, Nitrate and Chloride of (See also Platers' Supplies).
Buchanan, C. G., Chemical Co., Cincinnati, O.
Jackson, John J., & Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.

Silver Ingots, Bars, Plates, Etc.
Jackson, John J., & Co., Newark, N. J.

Silver Refiners.
Jackson, John J., & Co., Newark, N. J.
Roessler & Hasslacher Chemical Co., New York.

Silver, Rolled Sterling.
Jackson, John J., & Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Silver Solder.
Jackson, John J., & Co., Newark, N. J.

Silver Trysalyt.
Roessler & Hasslacher Chemical Co., New York.

Silver Wire.
Jackson, John J., & Co., Newark, N. J.

Slitting Machines.
Torrington Manufacturing Co., Torrington, Conn.

Smelters of Copper-Bearing Materials.
Ajax Metal Co., Philadelphia, Pa.
Balbach Smelting & Refining Co., Newark, N. J.
Capper Pass & Son, Ltd., Bristol, England.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Philadelphia, Pa.

Smelters and Refiners, Gold and Silver.
Genesee Metal Co., Rochester, N. Y.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Smelters and Refiners—White Meal.
Ajax Metal Co., Philadelphia, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., New York.

Soap (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
International Chemical Co., Camden, N. J.
Munning-Loeb Co., Matawan, N. J.
Wiarda, John C., & Co., Brooklyn, N. Y.

Solder, Aluminum.
Aluminum Company of America, Pittsburgh, Pa.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Kemp, W. H., Co., New York.
Richards & Co., Boston, Mass.
United Smelt. & Aluminum Co., New Haven, Conn.
U. S. Reduction Co., Chicago, Ill.

Solder, Brazing.
Ajax Metal Co., Philadelphia, Pa.
Hussey, C. G., & Co., Pittsburgh, Pa.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Union Smelting & Refining Co., New York.

Solder, Hard, for Cast Iron.
Lang, R. F., New York.

Solder, Wire.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., New York.

Soldering Flux.
Crown Rheostat & Supply Co., Chicago, Ill.
L'Hommedieu, Chas. F., Sons & Co., Chicago, Ill.
Richards & Co., Boston, Mass.
Wiarda, John C., & Co., Brooklyn, N. Y.

Soldering Irons.
Hendricks Bros., New York.
Hussey, C. G., & Co., Pittsburgh, Pa.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Solder Molds.
Schweizer, Chas. K., Co., St. Louis, Mo.

Solder, Silver.
Jackson, John J., & Co., Newark, N. J.

Solder, Tinners'.
Columbia Smelting & Refining Works, New York
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., New York.

Soluble, Cotton.
Dupont Chemical Works, New York.
Fuerst Bros. & Co., New York.
Wiarda, John C., & Co., Brooklyn, N. Y.

Specialties, Steam and Water.
Ohio Blower Co., Cleveland, O.

Spelter.
Birkenstein, S., & Sons, Chicago, Ill.
Damascus Bronze Co., Pittsburgh, Pa.
Genessee Metal Co., Rochester, N. Y.
Hegeler Bros., Danville, Ill.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Illinois Zinc Co., Peru, Ill.
Leavitt, C. W., & Co., New York.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
New Jersey Zinc Co., The, New York.
Richards & Co., Boston, Mass.
Sandoval Zinc Co., Chicago, Ill.
Trotter, Nathan, & Co., Philadelphia, Pa.
U. S. Reduction Co., Chicago, Ill.

Spelter Solder (See Solder, Brazing).

Spinning Lathes.
Bliss, E. W., Co., Brooklyn, N. Y.
Pryibil, P., Inc., New York.
Wilcox Manufacturing Co., Chicago, Ill.

Spinning, Copper, Brass, Aluminum, Steel, Etc. (See also Metal Goods Made to Order).
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Vaughn, J. H., Mfg. Co., Taunton, Mass.

Spraying Hoods, Tables, Etc.
De Vilbiss Mfg. Co., Toledo, O.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Eureka Pneumatic Spray Co., New York.
Paasche Air Brush Co., Chicago, Ill.

Spraying Machines for Lacquer, Japan, Enamel, Etc.
De Vilbiss Mfg. Co., Toledo, O.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Eureka Pneumatic Spray Co., New York.
Paasche Air Brush Co., Chicago, Ill.

Spraying Machines, Molten Metal.
Metals Coating Co. of America, Chicago, Ill.

Sprue Cutters (See also Foundry Supplies).
Bliss, E. W., Co., Brooklyn, N. Y.
Coleman Foundry Equipment Co., Cleveland, O.
Shuster, The F. B., Co., New Haven, Conn.
Stevens, Frederic B., Detroit, Mich.
Turner Machine Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Stampings, Metal (See also Metal Goods made to order).
Enterprise Mfg. Co., Akron, O.
Globe Machine & Stamping Co., Cleveland, O.
Riverside Metal Co., Riverside, N. J.
Root, C. J., & Co., Bristol, Conn.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Steel Shop Fittings.
Sly, W. W., Mfg. Co., Cleveland, O.

Sterling Silver Sheets.
Jackson, John J., Newark, N. J.

Stirrers, Graphite (See Crucibles, etc.).

Stoneware, Chemical.
German-American Stoneware Works, New York.

Stoneware, Exhaust Fans.
German-American Stoneware Works, New York.

Stoneware Tanks, Dipping Baskets, Etc.
Burns, E. R., Supply Co., Broklyn, N. Y.
German-American Stoneware Works, New York.
L'Hommedieu, Chas. F., Sons & Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Wiarda, John C., & Co., Brooklyn, N. Y.

Sulphuret of Potassium.
Apothecaries Hall Co., Westbury, Conn.
Buchanan, C. G., Chemical Co., Cincinnati, O.
Roessler & Hasslacher Chemical Co., New York.
Wiarda, John C., & Co., Brooklyn, N. Y.

Sweep Smelters (See Smelters, Sweep).

Tacks (See name of metal wanted).

Tanks, Electroplaters' (See also Platers' Supplies).
Astle, H. J., & Co., Providence, R. I.
Burns, E. Reed, Supply Co., Brooklyn, N. Y.
Chadwick-Boston Lead Co., Boston, Mass.
Corcoran, A. J., Inc., New York.
German-American Stoneware Works, New York.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
Stearns, The A. T., Lumber Co., Boston, Mass.
Stevens, Frederic B., Detroit, Mich.
Wiarda, John C., & Co., Brooklyn, N. Y.

Tanks, Stoneware.
German-American Stoneware Works, New York.
L'Hommedieu, Chas. F., Sons & Co., Chicago, Ill.

Testing, Laboratories.
Dover Laboratory, Dover, N. J.
Ledoux & Co., New York.

Tin, Chloride of.
Apothecaries Hall Co., Waterbury, Conn.
Wiarda, John C., & Co., Brooklyn, N. Y.

Tinning Equipment.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Menker, The, Company, Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Tin, Pig, Bar and Block.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Trotter, Nathan, & Co., Philadelphia, Pa.
U. S. Reduction Co., Chicago, Ill.

Tin Tubing.
Chadwick-Boston Lead Co., Boston, Mass.
Michigan Smelting & Refining Co., Detroit, Mich.

Tin, Sheet Block.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

Titanium Alloys.
Goldschmidt Thermit Co., New York.

Tobin Bronze.
American Brass Co., Waterbury, Conn.

Tongs, Crucible and Pick-Up.
Whiting Foundry Equipment Co., Harvey, Ill.

Tripoli Composition (See Buffing and Polishing Compositions).

Trisalyt Triple Salts.
Roessler & Hasslacher Chemical Co., New York.

Tube Mill Machinery.
Torrington Mfg. Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Tubes (See name of metal wanted).

Tumbling Barrels (See also Foundry Supplies and Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Bolssier Electric Co., New York.
Coleman Foundry Equipment Co., Cleveland, O.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.
Smith, Richardson Co., Attleboro, Mass.
Stevens, Frederic B., Detroit, Mich.
Wadsworth Core Machine & Equip. Co., Akron, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Whiting Foundry Equipment Co., Harvey, Ill.

Type Metal.
Ajax Metal Co., Philadelphia, Pa.
Columbia Smelting & Refining Works, New York.
Illinois Smelting & Refining Co., Chicago, Ill.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Turntables, Cars, Etc.
Whiting Foundry Equipment Co., Harvey, Ill.

Vacuum Pumps.
Leiman Bros., New York.

Vanadium Alloys.
Goldschmidt Thermit Co., New York.

Ventilators and Apparatus (See Dust Collectors, Etc.).

Vienna Lime Compositions (See Buffing and Polishing Compositions).

Voltmeters (See also Platers', Polishers and Galvanizers' Supplies).
Bolssier Electric Co., New York.
Crown Rheostat & Supply Co., Chicago, Ill.
General Electric Co., Schenctady, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.

Wattmeters.
General Electric Co., Schenectady, N. Y.

Wax Wire (See also Foundry Supplies).
Stevens, Frederic B., Detroit, Mich.

Welding Apparatus, Arc.
General Electric Co., Schenectady, N. Y.

Whale Oil Soap.
Apothecaries Hall Co., Waterbury, Conn.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
International Chemical Co., Camden, N. J.
Wiarda, John C., & Co., Brooklyn, N. Y.

White Finish (See Buffing and Polishing Compositions).

White Metal Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Columbia Smelting & Refining Works, New York.
Illinois Smelting & Refining Co., Chicago, Ill.

White Metal Rolling for the Trade.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Wire (See name of metal wanted).

Wire Coilers.
Baird Machine Co., Bridgeport, Conn.
Torrington Manufacturing Co., Torrington, Conn.

Wire Goods Manufacturers (See also Metal Goods made to order).
Baird Machine Co., Bridgeport, Conn.

Wire Mill Equipment.
Torrington Manufacturin Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Wire Nails, All Metals.
Hassall, John, Inc., Brooklyn, N. Y.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Wire Straightening and Forming Machinery.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Shuster, The F. B., Co., New Haven, Conn.

Wire Wheel and Hand Brushes (See also Foundry Supplies).
Blumenthal, H., & Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Zinc Battery Plates.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.

Zinc, Chloride of (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Buchanan, C. G., Chemical Co., Cincinnati, O.
Cooper, Charles, & Co., New York.
Fuerst Bros. & Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
Richards & Co., Boston, Mass.
Roessler & Hasslacher Chemical Co., New York.
Sandoval Zinc Co., Chicago, Ill.
Wiarda & Co., John C., Brooklyn, N. Y.

Zinc, Cold Rolled, in Coil.
Platt Bros. Co., Waterbury, Conn.

Zinc Cyanide.
Apothecaries Hall Co., Waterbury, Conn.
Roessler & Hasslacher Chemical Co., New York.

Zinc, Dust (See also Platers' Supplies).
Cooper, Charles, & Co., New York.
Fuerst Bros. & Co., New York.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Leavitt, C. W., & Co., New York.
New Jersey Zinc Co., New York.
Roessler & Hasslacher Chemical Co., New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Zinc Salts, Commercial (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Buchanan, C. G., Chemical Co., Cincinnati, O.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Cooper, Charles, & Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Manufacturers' Brush Co., Cleveland, O.
Sandoval Zinc Co., Chicago, Ill.
Wiarda & Co., John C., Brooklyn, N. Y.

Zinc, Sheet and Plates.
American Nickeloid Co., Peru, Ill.
Apollo Metal Works, La Salle, Ill.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
National Sheet Metal Co., Peru, Ill.
Pilling Brass Co., Waterbury, Conn.
Platt Brass Co., Waterbury, Conn.
Richards & Co., Boston, Mass.

Zinc Trisalyt.
Roessler & Hasslacher Chemical Co., New York

ALPHABETICAL INDEX OF ADVERTISERS

A

Page.

Abbott Ball Co., Hartford, Conn. 25
Acme Die-Casting Co., Brooklyn, N. Y. 45
Ajax Metal Co., Philadelphia, Pa. 39
Aluminum Co. of America, Pittsburgh, Pa. 37 and 38
American Cupro-Nickel Co., New York. 41
American, The, Brass Co., Waterbury, Conn. 40
American Manganese Bronze Co., Philadelphia, Pa. 60
American Boron Products Co., Reading, Pa. 9
American Nickeloid Co., Peru, Ill. 42
Ames Sword Co., Chicopee, Mass. 15
Anthony, H. M., Co., New York. 4
Apollo Metal Works, La Salle, Ill. 42
Apothecaries Hall Co., Waterbury, Conn. 27
Armstrong Cork & Insulating Co., Pittsburgh, Pa. 5
Automatic Buffing Machine Co., Buffalo, N. Y. 17
Astle, H. J., & Co., Providence, R. I. 19

B

Baird Machine Co., Bridgeport, Conn. 15
Balbach Smelting and Refining Co., Newark, N. J. 43
Bartley, Jonathan, Crucible Co., Trenton, N. J. 8
Basic Mineral Co., Pittsburgh, Pa. 11
Battle Creek Sand Sifter Co., Battle Creek, Mich. 11
Benson, H. K. & F. S., Glen Ridge, N. J. 41
Birkenstein, S., & Sons, Chicago, Ill. 43
Blassett, E., Jr., New York. 45
Bliss, E. W., & Co., Brooklyn, N. Y. 14
Blumenthal, H., & Co., New York. 18
Bogue, Chas. J., Electric Co., New York. 23
Boissier Electric Co., New York. 23
Bridgeport Brass Co., Bridgeport, Conn. 40
British Aluminum Co., Ltd., New York. 39
Buchanan, C. G., Chemical Co., Cincinnati, O. 31
Burns, E. Reed, Supply Co., Brooklyn, N. Y. 31

C

Capper Pass & Son, Ltd., Bristol, England. 43
Celluloid Zapon Co., New York. 35
Chadwick-Boston Lead Co., Boston, Mass. 19
Churchill, W. L., New York. 11
Clarage Fan Co., Kalamazoo, Mich. 19
Clark, Jas., Jr., Electric Co., Inc., Louisville, Ky. 11
Corcoran, A. J., Inc., New York. 20
Coleman Foundry Equipment Co., Cleveland, O. 12
Columbia Smelting & Refining Works, New York 43
Connecticut Dynamo & Motor Co., Irvington, N. J. 21
Cooper, Charles, & Co., New York. 34
Crown Rheostat & Supply Co., Chicago, Ill. 23

D

Damascus Bronze Co., Pittsburgh, Pa. 60
De Vilbiss Mfg. Co., Toledo, O. 33
Dings Electro-Magnetic Separator Co., Milwaukee, Wis. 12
Divine Bros. Co., Utica, N. Y. 15
Dixon, Jos., Crucible Co., Jersey City, N. J. 4
Doehler Die Casting Co., Brooklyn, N. Y. 44
Dover Laboratory, Dover, N. J. 45
Drachsler, A. A., Inc., New York. 18
Driver-Harris Wire Co., Harrison, N. J. 7
Dupont Chemical Co., New York. 34

E

Eager Electric Co., Watertown, N. Y. 22
Eclipse Air Brush Co., Newark, N. J. 33
Egyptian Lacquer Mfg. Co., New York. 34
Electric Smelting & Aluminum Co., Lockport, N. Y. 26 and 61
Enterprise Mfg. Co., Akron, O. 44
Eureka Pneumatic Spray Co., New York. 33

F

Franco-American Chemical Works, Carlstadt, N. J. 34
Fuerst Bros. & Co., New York. 34

G

Page.

Gardner Machine Co., Beloit, Wis. 16
Garrison, A., Foundry Co., Pittsburgh, Pa. 15
Gautier, J. H., & Co., Jersey City, N. J. 4
Gehnrich, Hermann, Brooklyn, N. Y. 33
General Bakelite Co., New York. 34
General Chemical Co., Philadelphia, Pa. 4
General Electric Co., Schenectady, N. Y. 23
Genesee Metal Co., Rochester, N. Y. 60
German-American Stoneware Works, New York. 20
Globe Machine & Stamping Co., Cleveland, O. 25
Goldschmidt Thermit Co., New York. 38

H

Hanson & Van Winkle Co., Newark, N. J. 30 and 31
Hassall, John, Brooklyn, N. Y. 39
Hawley Down Draft Furnace Co., Easton, Pa. 6
Hegeler Zinc Co., Danville, Ill. 42
Hendricks Bros., New York. 40
Hussey, C. G., & Co., Pittsburgh, Pa. 40

I

Ideal Furnace Co., Chester, Pa. 6
Illinois Zinc Co., Peru, Ill. 42
Illinois Smelting & Refining Co., Chicago, Ill. 43
International Chemical Co., Camden, N. J. 62
International Nickel Co., New York. 60

J

Jackson, John J., Newark, N. J. 41
Jantz & Leist Electric Co., Cincinnati, O. 21

K

Kalbfleisch, Franklin H., Co., New York. 34
Kelch, G., New York. 45
Kemp, W. H., Co., New York. 60
Knickerbocker Co., The, Jackson, Mich. 18

L

Lang, R. F., New York. 39
Leavitt, C. W., & Co., New York. 43
Ledoux & Co., New York. 45
Leiman Bros., New York. 18
L'Hommedieu, C. F., & Sons Co., Chicago, Ill. 20
Light Mfg. & Foundry Co., Pottstown, Pa. 44

M

Manhattan Brass Co., New York. 41
Matthiesen & Hegeler Zinc Co., La Salle, Ill. 42
McCullough-Dalzell Crucible Co., Pittsburgh, Pa. 4
McLachlen, John M., Washington, D. C. 45
Meaker Company, The, Chicago, Ill. 29
Michigan Smelting & Refining Co., Detroit, Mich. 60
Moers, E. M., Sons, New York. 43
Monarch Engineering & Mfg. Co., Baltimore, Md. 2 and 3
Mott Sand Blast Mfg. Co., New York. 11
Munning-Loeb Co., Matawan, N. J. 28

N

National Co., The, Waterbury, Conn. 41
National Brass & Copper Co., Lisbon, O. 40
National Sheet Metal Co., Peru, Ill. 42
Newport Sand Bank Co., Inc., Newport, Ky. 11
New Jersey Zinc Co., New York 42
Niagara Alkali Co., Niagara Falls, N. Y. 26
No-Dust Drying Machine Co., Providence, R. I. 26
North American Smelting Co., Philadelphia, Pa. 60

O

Ohio Blower Co., Cleveland, O. 18

P

Paasche Air Brush Co., Chicago. 33
Parsons, W. R., Chicago, Ill. 25
Paxson, J. W., Co., Philadelphia, Pa. 6
Pfleghar Hardware Specialty Co., New Haven, Conn. 39
Phipps Charcoal Co., Ironton, O. 10
Phosphor Bronze Smelting Co., Ltd., Phila., Pa. 60
Pilling Brass Co., Waterbury, Conn. 41
Platt Bros. & Co., The, Waterbury, Conn. 42
Pryibil, P., Inc., New York. 14

Q

Quigley Furnace & Foundry Co., New York. 7

R

Radnal, Josef, New York. 43
Richards & Co., Boston, Mass. 61
Riverside Metal Co., Riverside, N. J. 40
Rockwell, W. S., Co., New York. 10
Roessler & Hasslacher Chemical Co., New York. 32
Rome Hollow Wire & Tube Co., Rome, N. Y. 41
Root, C. J., Co., Bristol, Conn. 45
Ross-Tacony Crucible Co., Philadelphia, Pa. 7

S

Sandoval Zinc Co., Chicago, Ill. 42
Schweizer, Chas. K., St. Louis, Mo. 4
Scovill Mfg. Co., Waterbury, Conn. 40
Seidel, R. B., Inc., Philadelphia, Pa. 8
Seymour Mfg. Co., The, Seymour, Conn. 40
Shuster, F. B., Co., New Haven, Conn. 14
Sievering, Philip, New York. 21
Sly, W. W., Mfg. Co., Cleveland, O. 13
Smith, John P., & Co., New Haven, Conn. 34
Smith, Richardson Co., Attleboro, Mass. 25
Sommer, John, Faucet Co., Newark, N. J. 4
Stamford Rolling Mills Co., Inc., New York 41
Standard Equipment Co., New Haven, Conn. 10
Standard Rolling Mills Inc., Brooklyn, N. Y. 40
Stearns, A. T., Lumber Co., Boston, Mass. 20
Steiner, E. E., Newark, N. J. 33
Stevens, Frederic B., Detroit, Mich. 30
Stimpson, Edwin B., Co., Brooklyn, N. Y. 44
Stitt, Jas. H., Co., New York. 26

T

Taunton-New Bedford Copper Co., New Bedford, Mass. 40
Taylor, Robert J., Inc., Philadelphia, Pa. 8
Titan Metal Co., Bellefonte, Pa. 38
Tolhurst Machine Works, Troy, N. Y. 26
Torrington Mfg. Co., Torrington, Conn. 15
Trotter & Co., Nathan, Philadelphia, Pa. 43
Turner Machine Co., Philadelphia, Pa. 13

U

Union Smelting & Refining Co., New York. 43
United Metals Selling Co., New York. 42
United Smelting & Aluminum Co., New Haven, Conn. 39
U. S. Electro Galvanizing Co., Brooklyn, N. Y. 1
U. S. Reduction Co., Chicago, Ill. 38

V

Vaughn, L. H., Taunton, Mass. 44

W

Wadsworth Core Machine & Equipment Co., Akron, O. 12
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. 39
Watson-Stillman Co., New York. 13
Wells, A. H., & Co., Waterbury, Conn. 41
Whipple & Choate, Bridgeport, Conn. 44
White & Bro., Inc., Philadelphia, Pa. 44
Whiting Foundry Equipment Co., Harvey, Ill. 10
Wiarda, John C., & Co., Brooklyn, N. Y. 31
Wilcor Manufacturing Co., Chicago, Ill. 14
Wood, R. A., Cheshire, Conn. 45
Wood, R. D., & Co., Philadelphia, Pa. 13
Wood, W. A., New York. 45

Yellow Ingot Brass — Spelter

METALS
GENESEE METAL CO.
ROCHESTER, N.Y.

Pig and Bar Lead — Pig and Bar Tin

North American Smelting Company

PHILADELPHIA

Phosphor Bronze — Anti-Acid Bronze
Climax Bronze — Manganese Bronze
Bronze and Brass Castings
Ingot Copper — Ingot Brass
Phosphor Copper — Phosphor Tin
Babbitt, Type, Linotype and Stereotype Metal
Tinners' and Brazing Solders
Lead and Block Tin Pipe

Quality Bronzes

CASTINGS AND FORGINGS

SPARE'S BRONZES TRADE MARK

We are supplying large quantities of Manganese Bronze Castings for the Isthmian Canal subject to Government inspection and test.

Government Compositions and Phosphor Bronze.

American Manganese Bronze Co.
Holmesburg, Philadelphia, Pa.

The Superiority
of
DETROIT STANDARD M S R INGOT BRASS

has been recognized by leading brass foundries. Its high quality, backed by our guarantee, makes it the most desirable composition ingot on the market. We know this to be a fact.

Others have told us—You will when you give it a trial.

MICHIGAN SMELTING AND REFINING CO.
DETROIT, MICH.

Damascus Phosphorized Copper

5%—10%—15%

Many years ago we originated phosphorized copper to assist foundry efficiency. Today we are the largest manufacturers of this compound, proving the excellence and economy of our products.

Write for valuable phosphorized copper booklet and prices.

Damascus Bronze Company
Pittsburgh

NICKEL Shot—High and low carbon Ingots—Two sizes, 25 lb., 50 lb.

Electrolytic Nickel—99.80%

Prime Metals for the manufacture of Nickel Steel, German Silver, Anodes, and all remelting purposes. Our Nickel is produced as rods, sheets, strip stock, wire and tubes.

MONEL METAL WE ARE SOLE PRODUCERS of this natural, stronger than steel, non-corrodible alloy. Manufactured forms are rods, flats, castings, tubes, sheets, strip stock and wire. Ask for descriptive booklet.

Send inquiries direct to us.

The International Nickel Company
43 EXCHANGE PLACE, NEW YORK

THE PHOSPHOR BRONZE SMELTING CO.
2200 Washington Avenue, Philadelphia, Pa.

ELEPHANT BRAND "Phosphor-Bronze."

INGOTS
SHEETS
WIRE

Castings for all purposes

Original and Sole Makers in the U. S.

DELTA METAL

CASTINGS, FORGINGS STAMPINGS

RODS for Bushings, Pinions, Pumps, Etc.
BUSHINGS cast in the rough, carried in STOCK

W. H. KEMP CO.

Rollers and Manufacturers of

Pure Aluminum in Sheets and Foil to thinness of 1/1000 of an inch. Aluminum in Ingots, Sheets, Rods, Wire and Tubing. Aluminum Solder and Rivets. Platers' Silver and Battery Plate 999 Fine. Platers' Brass, Oreide and German Silver.

ALUMINUM LEAF AND POWDER FOR DECORATIVE PURPOSES

Bronze Liquid for Mixing the Powder.
Send for Price List M I.

165, 167 Spring St., N. W. cor. West Broadway
NEW YORK

FOR INDEX TO ADVERTISEMENTS SEE PAGE 59

METALS

ALLOYS

Nickel Aluminum
No. 15 Aluminum
Aluminum-Zinc Alloy
5% Aluminum Bronze
10% Aluminum Bronze
11% Aluminum Bronze
Aluminum Solder
Manganese Bronze
Silver Bronze
Phosphor Tin
Silicon Copper
Manganese Copper No. 1
Manganese Copper No. 2
Manganese Alloy
Phosphor Copper
Babbitt

"Ingots with a Reputation"

PURITY UNSURPASSED
PRICES CONSISTENT
SHIPMENTS PROMPT

26 YEARS' EXPERIENCE
IT WILL PAY YOU TO GET FIGURES

THE ELECTRIC SMELTING AND ALUMINUM CO.
LOCKPORT, NEW YORK

1812 **DON'T THINK** 1915
because you find some brands of
WESTERN SPELTER
unsatisfactory, that every brand
IS BAD

We make it our business to test each of the many grades we handle, which relieves you of risk on any order with which you may favor us. We also sell remelted spelter and

"EVERY METAL THE BRASS FOUNDER NEEDS."

RICHARDS & COMPANY, Inc.
200-206 CAUSEWAY STREET
117-125 BEVERLY STREET . . . . BOSTON

FOR INDEX TO ADVERTISEMENTS SEE PAGE 59

No Need
To Worry
About
Real Potash

International Metal Cleaner
No 121

is being widely used in place of Real Potash by a large number of manufacturers who are cleaning the most difficult kinds of work, with satisfactory results.

Let our Expert advise you **No charge for his services**

International Chemical Co.

Camden, N. J.

Chemicals for the cleaning of Metal Work our specialty